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MODERN MECHANICS AND INVENTIONS

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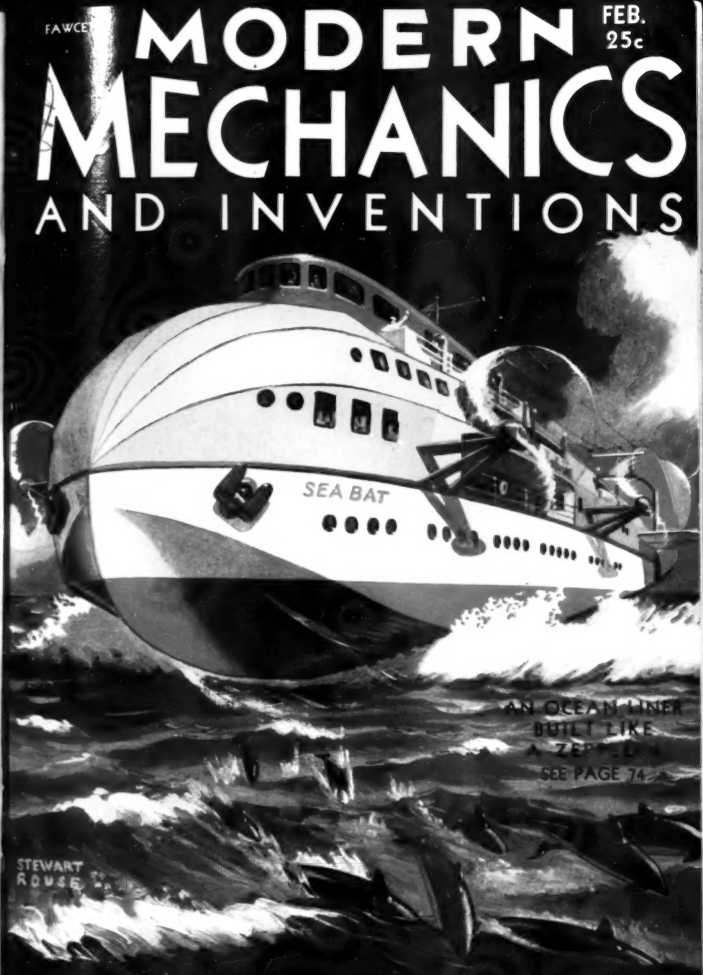

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ANNOUNCING

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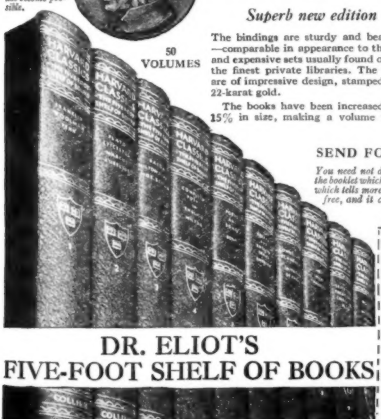

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MODERN MECHANICS AND INVENTIONS

PRICE 25 CENTS

This magazine is not connected with or associated with any other magazine of a scientific or mechanical nature.

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February, 1931

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HIGH SPOTS IN THIS ISSUE

Do you like a good argument? On page 48 of this issue Major H. H. Arnold answers the question, "What is Wrong with Aviation?" which appeared in a national weekly recently. Our lead-off article answers a question which concerns us all—"What will Your Next Car Look Like?" On page 132 you will find that "How-to-Build" you've been looking for.

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Edited by Experts

Listed here are the members of the Modern Mechanics Board of Editors, all qualified by national repute to serve as authorities. They will gladly answer questions from readers if stamped envelope is sent. Address them in care of this magazine, 529 S. 7th St., Minneapolis, Minn.

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Last Year's Pay Looks Like Small Change to These Men Today!

A 380% Increase!
From $75 a month to $300 and more per month—that's the jump M. B. Scholes made after N. S. T. A. Credits N. S. T. A. training with his success and N. S. T. A. Employment Department for his present big pay job.

Doubled His Pay
A. Robitaille found in N. S. T. A. training "a lifetime of selling experience." "My earnings have jumped to 100% more than I got at the time I began studying your course."

Worth $5,000 To Him
"I wouldn't take $5,000 for what you've done for me," writes C. B. Sterling. "Your training has actually increased my income over 900%." Shortly after enrolling, he led the sales force of his company.

Earns 2 Years Pay In 3 Months
J. H. Huppert, a $23 a week plumber's apprentice, found selling furs easier and more profitable than fixing leaks after N. S. T. A. training. In his first 3 months he had made more money than in two years at his old job.

His Own Boss—At Doubled Wages
"I'm my own boss now" proudly writes W. Hayes, an N. S. T. A. graduate. "Since taking this course I have more than doubled my income. In one week recently three other concerns tried to hire him away from his present job.

$5,000 A Year!
Ask J. A. Tetland if N. S. T. A. training pays. A French-Canadian railroad man—little education in English, N. S. T. A. training won him a sales mastership at $5,000 a year **to start.**

Here are six men who were formerly caught in the hopeless tread-mill of low-pay jobs. Today every one of them report earnings from $4,000 up to $10,000 a year! Right now the same opportunity that changed their lives so completely is open to you! Don't fail to read every word of this vital message!

WHEN a man who has been struggling along in a low-pay job suddenly steps out and starts earning real money—$5,000, $7,500, or $10,000 a year, he usually gives his friends quite a shock. It is hard for them to believe that he is the same man they used to know. Take one of the men whose pictures appear on this page—J. H. Huppert, for example. Huppert was a plumber's apprentice at $23 a week. If he had predicted that he was about to make two years' pay within a period of three months, his friends would have thought he was joking. But he knew what he wanted, and he set about getting it in the shortest possible way. "The Key To Master Salesmanship" opened his eyes to the opportunities in the selling profession. This book proved that Master Salesmen are made, not "born." It told facts and secrets about money-making that were a positive revelation. And best of all, it outlined a simple plan that enables men from all walks of life to quickly reach the top without spending years on the road—without losing a day or a dollar from their present positions!

A Few Weeks—Then Bigger Pay

Huppert seized the opportunity to qualify as a Master Salesman, and has richly profited by it. He now reports an increase of many times his former weekly earnings, and his future possibilities are unlimited. Some of his former friends perhaps say he was "lucky." He was. But his "luck" lay in his decision to cast his lot with the N. S. T. A. Thousands of other men have been similarly "lucky." Some report increases ranging up to 900%. They have forgotten the days when they were caught in the rut—but they never forget that they owe a great part of their success to N. S. T. A. training.

National Salesmen's Training Association
Dept. B-703, N. S. T. A. Bldg., Chicago, Illinois.

Send for This FREE Book

You may have doubts in your own mind about how salesmanship can help you to solve your own problem. If so, we cannot urge you too strongly to read the same fascinating message that inspired Huppert, Ferland and Scholes, and the thousands of others who took this remarkable short cut to success. If we were asking two or three dollars a copy for "The Key To Master Salesmanship," you might hesitate. But it is now FREE! See for yourself what salesmanship has done for others—and what the National Salesmen's Training Association stands ready to do for you. No matter what your present thoughts on selling are, "The Key To Master Salesmanship" will give you a new insight into this fascinating and highly-paid profession. Mail the coupon for your Free copy NOW!

National Salesmen's Training Assn.,
Dept. B-703, N.S.T.A. Bldg., Chicago, Ill.

Without cost or obligation I will accept a copy of your book, "The Key To Master Salesmanship," and details of your System of Training and Free Employment Service.

Name .....

Address .....

City ..... State .....

Age ..... Occupation .....

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If You Are Suffering

From Colds, Coughs, Catarrh, Bronchitis, Asthma, Rheumatism, Neuralgia, Arthritis, Neuritis

READ
The Strange Story *of*
JOHN F. CLASS

JOHN F. CLASS

Who cured himself of an "incurable disease" —and in doing so discovered a marvelous new system of treatment which those who use it say "gives almost miraculous results."

JOHN F. CLASS suffered agonies for 15 years—at the age of 50 was judged a hopeless case by doctors. Now, at 71, he is robust, active, healthy, never knowing a minute of ache or pain. He cured himself by his own discovery. Since then this has been used to treat over thousands of sufferers who have thronged to him for relief after other methods had brought them nothing but pain, misery, loss of time and waste of money, discouragement and despair.

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POSITIVE PROOF TEST

If you suffer, take the hand I offer you—the hand that has lifted others from misery. Make my Positive Proof Test in your own home **at my risk.**

Now brings to homes of sufferers the amazing discovery which restored him, after 15 years of agony and which has brought relief to thousands who came to his famous institutions for treatment.

Find Relief — At My Risk In Your Own Home

I don't care how bad your case is; I don't care how deep-seated or long standing; or how many other treatments you have tried. **Don't give up hope!** I am so anxious to help men and women who suffer that I will send my device to you for 10 DAYS' TRIAL IN YOUR OWN HOME AT MY RISK.

SEND NO MONEY

Just send coupon. Don't take my word. Don't even take the word of thousands of others who say my method has brought permanent relief. **Try it yourself at my risk!** If my method fails, the trial costs you nothing. If it brings you the relief I expect, you will be grateful all your life. Send the coupon —get my FREE book that has led thousands of sufferers to enjoyment of life. Don't delay the revelation that awaits you. Mail the coupon at once—today!"

$17,800 IN A YEAR
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POSITIVE PROOF COUPON

John F. Class, President,
John F. Class Health Fume System,
42 Monument Avenue, Dayton, Ohio

Please send full information about your remarkable discovery, your FREE book, details of POSITIVE PROOF Test and Trial In My Own Home At Your Risk. I desire relief from .....

.....

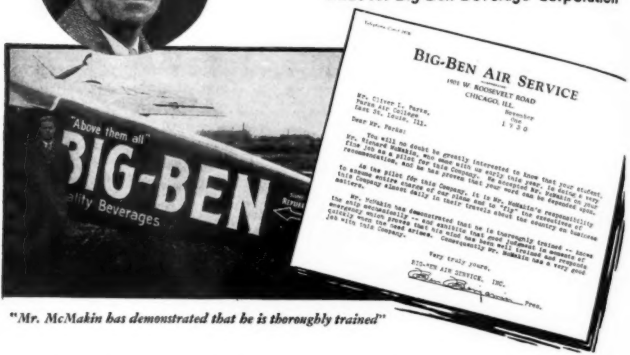
Name .....

Address .....

☐ Check here if interested in John F. Class Institution franchise in your locality.

ANOTHER PARKS TRAINED STUDENT MAKES GOOD

The Story of
Richard McMakin
Pilot for Big-Ben Beverage Corporation



"Mr. McMakin has demonstrated that he is thoroughly trained"

Limited Commercial Training at Parks Classes McMakin as a "Top-Grade" Pilot

WE DON'T need to say much, in this advertisement. *The facts speak for themselves!* Here's another Parks graduate (February, 1930) that is a "top-grade" pilot. And don't forget! He took *only a Limited Commercial Course*—yet read again what his employer says of his training and ability. Isn't *this* the kind of training *you* want? Then, clip the coupon NOW, and get full information.

Parks Air College was one of the first to be licensed by the U. S. Department of Commerce as a fully accredited transport school

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World's Largest and Finest Civilian Flying School
DIVISION OF DETROIT AIRCRAFT CORPORATION
Section 1-280 Parks Airport
EAST ST. LOUIS ILLINOIS

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--COUPON--

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1-280 Parks Airport, East St. Louis, Ill.

Without cost or obligation to me, please mail your illustrated catalog.

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Street address .....
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I am interested in Pilot's Course ☐ Mechanic's Course ☐

Thank You for Mentioning Modern Mechanics and Inventions for February When Writing to Advertisers

What Will You Be Doing One Year From Today?

Three hundred and sixty-five days from now—what?

Will you still be struggling along in the same old job at the same old salary—worried about the future—never quite able to make both ends meet—standing still while other men go ahead?

One year from today will you still be putting off your start toward success—thrilled with ambition one moment and then cold the next—delaying, waiting, fiddling away the precious hours that will never come again?

Don't do it, man—don't do it. There is no greater tragedy in the world than that of a man who stays in the rut all his life, when with just a little effort he could bring large success within his grasp.

Make up your mind today that you're going to train yourself to do some one thing well. Choose the work you like best in the list below, mark an X beside it, mail the coupon to Scranton, and we will send you, without cost or obligation, the full story of what the I.C.S. can do for you.

Right now you can decide where you will be this time next year.

Common sense will tell you that it is far better to send in this Success Coupon today than to wait another precious year and then wish you had!

Mail the Coupon for Free Booklet

INTERNATIONAL CORRESPONDENCE SCHOOLS, Box 2317-J, Scranton, Penna.

"The Universal University"

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the course *before* which I have marked X in the list below:

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☐ Industrial Management	☐ Bookkeeping	☐ Business Correspondence	☐ Grade School Subjects
☐ Personnel Management	☐ Secretarial Work	☐ Show Card and Sign Lettering	☐ High School Subjects
☐ Traffic Management	☐ Spanish	☐ Stenography and Typing	☐ Cartooning
☐ Accounting and C.P.A. Coaching	☐ French	☐ Railway Mail Clerk	☐ Illustrating
	☐ Salesmanship		☐ Lumber Dealer

TECHNICAL AND INDUSTRIAL COURSES

☐ Architect	☐ Electric Car Running	☐ Automobile Work	☐ Highway Engineer
☐ Architectural Draftsman	☐ Telegraph Engineer	☐ Aviation Engines	☐ Chemistry ☐ Pharmacy
☐ Building Foreman	☐ Telephone Work	☐ Plumber and Steam Fitter	☐ Mining Engineer
☐ Concrete Builder	☐ Mechanical Engineer	☐ Plumbing Inspector	☐ Navigation ☐ Assayer
☐ Contractor and Builder	☐ Mechanical Draftsman	☐ Foreman Plumber	☐ Iron and Steel Worker
☐ Structural Draftsman	☐ Machine Shop Practice	☐ Heating and Ventilation	☐ Textile Overseer or Supt.
☐ Structural Engineer	☐ Toolmaker ☐ Patternmaker	☐ Sheet-Metal Worker	☐ Cotton Manufacturing
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☐ Electric Lighting	☐ Gas Engine Operating	☐ R. R. Positions	☐ Mathematics ☐ Radio

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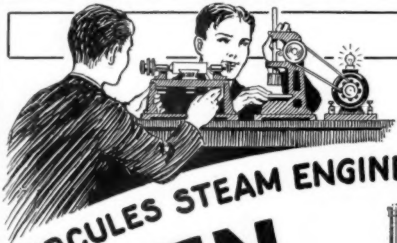
City..... State.....



HERCULES STEAM ENGINE GIVEN

Here's a wonderful offer. This big, powerful "Little Hercules" Steam Engine—a top-notch machine, made by Weeden, world's leading maker of Finest quality, highly finished, trimmed in bright colors. Has heavy fly-wheel, smooth-running piston and heavy cylinder, strong boiler and fittings. Large firebox. Pulley wheel that will run mechanical toys like Erector, Meccano, etc. Runs on alcohol or canned heat.

A big, POWERFUL, high-quality steam engine. Just what you've been waiting for—and you can have it FREE! Read Special Offer.

SENSATIONAL STORIES

The Open Road for Boys is a 50-page boys' magazine just crammed brimful of thrills. The kind of blood-stirring stories you've been looking for. Tales of high adventure on land and sea. Air stories that take your breath away, of war pilots in deathly combat above the clouds, of mail pilot heroes.

Sport stories, school stories, tales of distant jungle lands, etc. No other magazine has stories like these. Best joke page published. World-wide correspondence club, friends in foreign lands. Stamps. Boy Mechanic tells you how to make all the things you want. OPEN ROAD PIONEER CLUB; best dope on hunting, fishing, camping. Contests galore with prizes for all. Extra money. One whale of a magazine say 200,000 readers. Red-blooded stories for red-blooded he boys. Read Special Offer.

12 thrilling issues!

Special Offer

Regular subscription price to Open Road for Boys is $1 per year (half of others). To make new friends we will send you the magazine for a whole year, twelve fat issues—for $1—and send you this wonderful Steam Engine FREE! This is a great offer. Act quickly. Send the coupon now.

USE COUPON

Open Road for Boys Magazine—Dept. MSE
130 Newbury Street, Boston, Mass.

Friends: Here's my dollar ($1). You bet I want to grab this great offer! Rush my steam engine to me and put me down for a year for the OPEN ROAD FOR BOYS.

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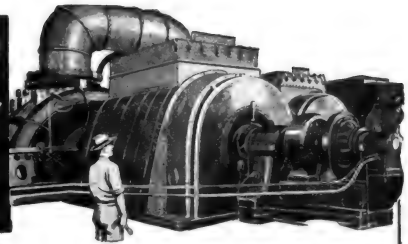

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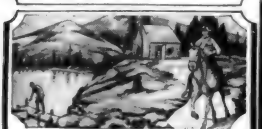

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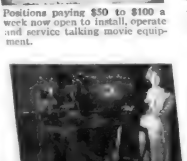

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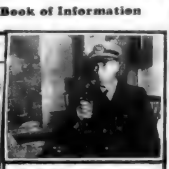

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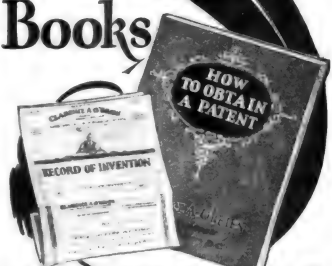

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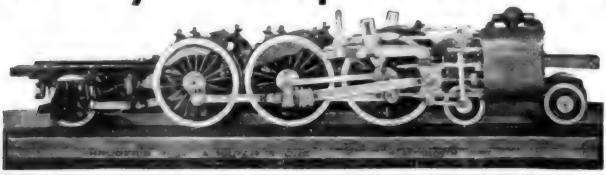
Andy's Shop Mail Box



John W. Crabill, of Plattsmouth, Nebraska, must be something of a wizard when it comes to building model locomotives. Here's the running gear of his latest effort which you can see is 36 inches long.

Andy, the ink-slinging grease monkey from the Double M hangar, each month opens up his sack of confidential fan mail and gives you a look-see at what's going on in the minds of the hangar gang.

WELL, gang, I made a resolution for this here new year which bears the license tag No. 1931, and that resolution is that I stow some of my gab and give a bit more space to some of my esteemed spies.

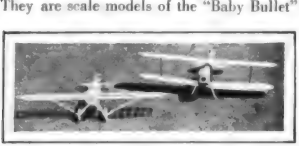
"Spies?" I hear you gasp.

Sure! Didn't you know that every columnist has to have spies to find out what's goin' on? I didn't know it myself until I got to readin' some of these here newspaper columns, but it seems that all of these guys have spies, so if I'm to be a big-timer I've got to have 'em too. These here fellers who write in and tell me all about what's happening in their neck of the woods are my secret agents, and I'm goin' to turn this space over to 'em right here and now. (Of course I'll break this resolution before long, but at least I'm goin' to start out right.)

Here's the first report. It's from Thomas Herker and Horner Stewart, of St. Paul, right across the river from me. These lads made the nifty little model planes shown below. They are scale models of the "Baby Bullet" and the "Lincoln" Sport plane. The boys say in part:

They were made from plans published in the 1930 FLYING MANUAL. All the controls work, and both planes can glide, having the center of balance in the correct place.

We have recently developed a type of model airplane which, so far as we know, has never been built before. It's a "Canard Tractor." It is just like an ordinary pusher but has a tractor propeller. It is a reversal of the Sizzlefoot type, combining all the worst features of the ordinary tractor and pusher, but our new type, it seems, combines all the best features. A front elevator is better for stabilizing on a model because it contributes lift instead of pulling down as a tail does. A tractor propeller is better than a pusher because of the friction a pusher prop has on the bearing. If this makes any records I'll let you know.



These models of the Baby Bullet and Lincoln biplane were built by two industrious St. Paul boys.

The fuselage of a Russell, the Heath pontoons, and an old Ford motor, and George Robertson, Brooklyn, gets 40 miles per hour.

There's a couple of lads who evidently know their model airplanes. And speaking of models, what think you of the running gear of that model locomotive being built by John W. Crabill, of Portsmouth, Nebraska?

(Continued on page 26)

If You Were DYING TO-NIGHT

and I offered you something that would give you ten years more to live, would you take it? You'd grab it. Well, fellows, I've got it, but don't wait till you're dying or it won't do you a bit of good. It will then be too late. Right now is the time. Tomorrow or any day, some disease will get you and if you have not equipped yourself to fight it off, you're gone. I don't claim to cure disease. I am not a medical doctor, but I'll put you in such condition that the doctor will starve to death waiting for you to take sick. Can you imagine a mosquito trying to bite a brick wall? A fine chance.

A Re-Built Man

I like to get the weak ones. I delight in getting hold of a man who has been turned down as hopeless by others. It's easy enough to finish a task that's more than half done. But give me the weak, sickly chap and watch him grow stronger. That's what I like. It's fun to me because I know I can do it and I like to give the other fellow the laugh. I don't just give you a veneer of muscle that looks good to others. I work on you both inside and out. I not only put big, massive arms and legs on you, but I build up those inner muscles that surround your vital organs. The kind that give you real pep and energy, the kind that fire you with ambition and the courage to tackle anything set before you.

All I Ask Is Ninety Days

Who says it takes years to get in shape? Show me the man who makes any such claims and I'll make him eat his words. I'll put one full inch on your arm in just 30 days. Yes, and two full inches on your chest in the same length of time. Meanwhile, I'm putting life and pep into your old backbone. And from then on just watch 'em grow. At the end of thirty days you won't know yourself. Your whole body will take on an entirely different appearance. But you've only started. Now comes the real work. I've only built my foundation. I want just 60 days more (90 in all) and you'll make those friends of yours who think they're strong look like something the cat dragged in.

A Real Man

When I'm through with you, you're a real man. The kind that can prove it. You will be able to do things that you had thought impossible. And the beauty of it is you keep on going. Your deep full chest breathes in rich pure air, stimulating your blood and making you just bubble over with vim and vitality. Your huge, square shoulders, and your massive muscular arms have that craving for the exercise of a regular he man. You have the flash to your eye and the pep to your step that will make you admired and sought after in both the business and social world.

This is no idle prattle, fellows. If you doubt me, make me prove it. Go ahead. I like it. I have already done this for thousands of others and my records are unchallenged. What I have done for them I will do for you. Come, then, for time flies and every day counts. Let this very day be the beginning of new life for you.

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Name ..... Age.....

Address .....

City ..... State.....

Andy's Shop Mail Box

(Continued from page 22)

Here's a novel method of water transportation with which the builder is no doubt scooting about New York harbor. Read the letter and see what it's about:

225 Bay Ridge Ave.,
Brooklyn, N. Y.

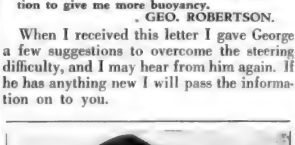
Gentleman: (That's me)

Enclosed find a picture of an air-drive sled I built using the Russell monoplane fuselage and Ed Heath's pontoons, using the plans published in good old MODERN MECHANICS AND INVENTIONS. I had an idea that the contraption would work out O. K. but when I gave her the gun and headed into the wind I found that there was no such thing as steering. With the rudder hard over she acted just like a weathervane.

I enlarged the rudder and it steered fairly well. The motor is a Model A Ford using a Storms conversion, swinging a Lang propeller having a 6¼' diameter and a 3' pitch. The speed obtained was 40 m.p.h. I added three feet to the Heath pontoons in proportion to give me more buoyancy.

GEO. ROBERTSON.

When I received this letter I gave George a few suggestions to overcome the steering difficulty, and I may hear from him again. If he has anything new I will pass the information on to you.



AND here's a missive from way down South, where I wouldn't mind being these cold days. This letter refers to the neat little sky-wagon shown above:

1309 S. Main St.,
Anderson, S. C.

Dear Sir:

The classy little two-place ship shown in the photograph is the work of Albert Dodd and Lawrence Jameson, both of Atlanta, Ga. The plane was assembled from parts of several jobs now out of production.

The motor is a 180 h.p. Hisso. The speed is about 140 miles per hour. The span is 28 feet. It is equipped with navigation lights. The shock absorbers are of the hydraulic type. This shows what can be done with parts of cracked-up planes.

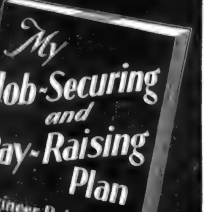
MANLEY MILLS.

The more I look at that crate the better it

(Continued on page 28)

To Help You Get A BETTER JOB . . .

I'll send you my Job-Securing Pay-Raising Plan



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Check your job here—or write your own in space below

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- ☐ Builders
- ☐ Pipe fitters
- ☐ Tool makers
- ☐ Telephone workers
- ☐ Pattern makers
- ☐ Steam fitters
- ☐ Engineers
- ☐ Railroad workers
- ☐ Chemists
- ☐ Textile workers
- ☐ Radio workers
- ☐ Factory workers of all kinds
- ☐ Mill workers
- ☐ Electricians
- ☐ Machinists
- ☐ Structural workers
- ☐ Bridge workers
- ☐ Auto mechanics
- ☐ Steam engineers
- ☐ Ventilation engineers
- ☐ Section foremen
- ☐ Air brake workers
- ☐ Coal miners
- ☐ Boiler makers
- ☐ Carpenters
- ☐ Bakers
- ☐ Contractors
- ☐ Electric and gas welding men
- ☐ Telegraph workers
- ☐ Building estimators
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- ☐ Plumbers heating
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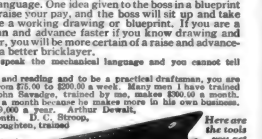
If you don't know blueprints, you cannot speak the mechanical language and you cannot tell anyone just what your idea is.

After I train you to know blueprint making and reading and to be a practical draftsman, you are ready to step into a job leading to salaries of from £5.00 to £200.00 a week. Many men I have trained are earning this money. I can prove that John Savadge, trained by me, makes £900.00 a month. Earl J. Dupree, trained by me, refused £600.00 a month because he makes more in his own business. A. H. Bernier, trained by me, earns £7,000 to £9,000 a year. Arthur Dewalt, trained by me, makes more than £400.00 a month. D. C. Stroop, trained by me, makes £475.00 a month. L. V. Broughton, trained by me, makes £300.00 a month.

I can give you many more names of Dobe-trained draftsmen who are making big salaries. They were me just as I am asking you to write. They asked for my Free Book. They saw that opportunities in all of the great industries were tremendous for draftsmen. Through drafting you can get into almost any industry you want.



As soon as you decide to fit yourself for a better job by learning plan drawing, blueprint making and blueprint reading—draftsmanship, and tell me that you have decided to go ahead, I will send you this fine imported set of drawing instruments shown here. You get them as my student. They come as part of the course.

I Train You at Home for a BETTER JOB!

You don't need to leave home to take this training. Neither do you need experience nor more than a simple education. Your age makes no difference, just so you are over sixteen. My method of training is so simple that almost anyone can grasp it. While you are learning in your home to be a draftsman, I make it possible for you to earn extra money by doing so. When you have finished, I help you to secure a position. If, after you have taken this training, you are not entirely satisfied, I return all of your money. Remember, all the training I give you is right at home. To teach you, I merely ask you to do the things you would have to do if you had a draftsman's job right now.

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FREE JOB-SECURING PLAN

ENGINEER DOBE, Div. 23-52
1951 Lawrence Ave., Chicago

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Send me, absolutely free, your big illustrated catalog of Automotive Opportunities.

Name .....

Address .....

Age ..... City ..... State .....

Andy's Shop Mail Box

(Continued from page 26)

looks to me. I hope it is entered in the Light Plane Contest, because I'd kinda like to get a peep at some of the details. Anybody who can get 140 from a cracked-up collection of junk powered with an old war-time Hisso deserves to get a lot of fun from the results of his work, and I'll bet that Messrs. Dodd and Jameson are doing just that.

JUST to change the subject, I'll give you a peep at a letter from my old friend, Oscar Schuwendt. Harken to what he has to say:

1035 Adoline St., Fresno, Calif.

Dear Andy:

Since you published the photographs of my little compressed air motor in the Shop Mail Box in the April and July issues I have been besieged with letters from fellows asking for prices on the complete motor and various and sundry accessories. At first I answered all the letters and told them that I couldn't furnish them with motors, but so few of them enclose any postage for an answer that I had to quit answering any except those who do, as the drain on the pocket-book has become too great.

I wonder if you would pass the word on to your readers that I cannot furnish completed motors or accessories. I can furnish blueprints for the construction of motors, however, and if they are interested in these their enquiries will be answered if they will enclose a stamp for reply. I don't want any free advertising, but would like to let the fellows know why their letters are being unanswered.

OSCAR SCHUWENDT.

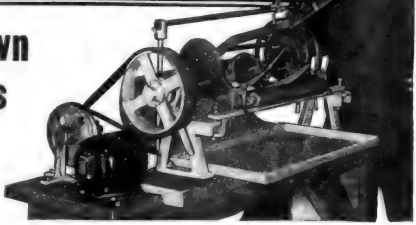
I know just how you feel about it, Oscar, and I'm forced to take the same measures myself. So if you fellows want to get any dope, hereafter, I wish you would enclose a stamped and addressed envelope for reply. The editors of Double M feel the same way about it as I do.

Here's the outboard cruiser "Allegra," with a few minor changes, which goes 25 miles per hour.

TURNING from postage stamps to boats, we have an enthusiastic letter here from a boat fan who built a neat little job from plans which we ran a few months ago:

(Continued on page 34)

This is the Way To Make MONEY



Have Your Own Cash Business AT HOME

That is what hundreds of men are doing with the Foley Electrakeen Lawn Mower Sharpener. Last year Woodmancy earned $25 to $30 a day. Morse earned $1520 in five months. No other method of sharpening lawn mowers can compare with the Foley Electrakeen. You can turn out perfect work quickly and easily.

No Experience Needed

Very easy to operate. Simply put the lawn mower in the machine and turn on the power—the Foley Electrakeen System automatically sharpens ALL blades and cutter bar at the same time to a perfect cutting edge. Easy work and a fine income.

Foley Electrakeen Lawn Mower Sharpener

Uses the same system as the leading lawn mower manufacturers. Sharpens all sizes and types of lawn mowers. Costs you only 1c a job and you get $1.00, $1.25, $1.50 each. Last Spring Walter Dambeck wrote: "I purchased a Foley Electrakeen Lawn Mower Sharpener three weeks ago and have already made enough money to pay for the machine and all expenses . . . "

Big Profits Can Be Earned!

Get started early in the season. There will be plenty of business waiting for you. People would rather have their lawn mowers sharpened the Foley way because they cut better and stay sharp longer. You can start this fine paying business in your spare time and make BIG MONEY. Small investment—easy monthly payments.

Read What These Users Say:

". . . I sharpened 85 mowers in the first ten days. This paid for the Foley Lawn Mower Sharpener in ten days' time . . . "
H. J. CANER, New York.

* * *

" . . . My brother and I have been working together and we paid for the machine in just two weeks . . . I am well pleased with the Foley Electrakeen Lawn Mower Sharpener and the work it turns out. I will recommend it to anyone . . . "
GEO. ENTRINGER, Wisconsin.

* * *

". . . have been sharpening mowers for the last 25 years, but never could do a job such as the Foley machine turns out . . . "
EDWIN SMITH, New York.

Send Coupon for Complete Information Today

FOLEY MANUFACTURING CO.

1520 Foley Building,
11 Main Street N. E.
Minneapolis, Minnesota.

Please send me complete information about the Foley Electrakeen Lawn Mower Sharpener and tell me how I can start my own fine paying business.

Name ..... Address .....

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SCALE model aeroplanes rubber and motor driven. Compressed air motors. Miniature Aircraft Corp., 93 Low Terrace, New Brighton, N. Y.

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AIRPLANE Models All Metal, Instructions 50 cents. Airplane Metals, 3050 Eastwood Ave., Chicago.

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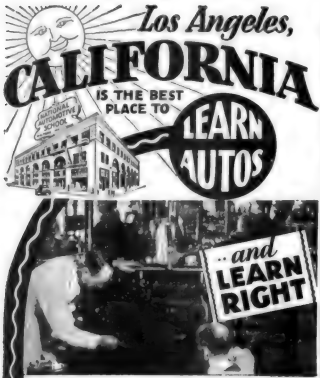

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Send me, absolutely free, your big illustrated Catalog of Automotive Opportunities.

Name _____

Address _____

Age _____ City _____ State _____

NATIONAL AUTOMOTIVE SCHOOL

Andy's Shop Mail Box

(Continued from page 28)

1 Cole Ave.,
Westboro, Ontario.

Dear Andy:

I am enclosing a photo of my "Allegra." You will notice I have changed the decking a wee bit, in spite of instructions in M.M., but that's because I'm English, I suppose. This was my first attempt, but not my last, I hope.

What do you think of the "Buss?" She does 26 per with an Elto Quad. I have two bunks, spring mattresses, and all complete. Gasoline stove, etc. I covered about 1200 miles this past summer. The boat cost $160.00 for material and was completed in seven weeks spare time, but how I did work changes.

I raised the cabin deck ten feet and double planked the bottom with another layer of cedar, canvas in between present and new bottom.

I realize this gives me more weight, but I really need it on the river I use, as we have lots of "deadheads" and floating logs to contend with. Anyway, it's comfort first with me now.

Kindest regards,
GUY B. PEEL.

THAT'S all right, Mr. Peel. We've no objections at all to having changes made in our plans. In fact, if a fellow seems to know what he's doing, as you evidently do, why go ahead and switch around anything you see fit. What I do object to is having somebody try to pass the buck onto me for the changes he contemplates. I'll always say, "Stick to the plans" if you ask me, but you're the bird that is paying the freight, so if you want to take the responsibility for changing plans which we are confident are Okay as is, why go to it, and more power to you for your individuality.

AND just to show you to what extent the light plane bug has bitten all of us, I am going to give you a peep at another letter which goes with the illustration:

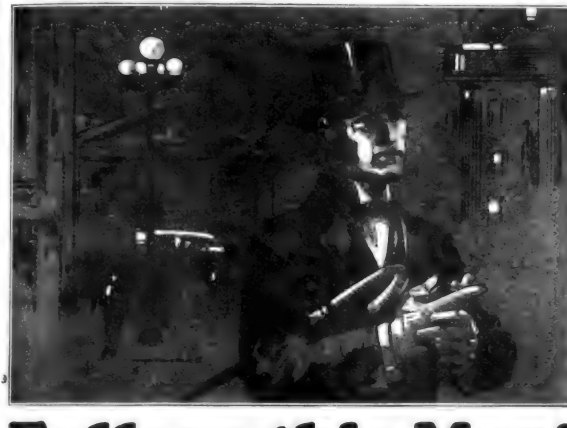
Delaware, Ohio.

Hello Andy:

Here is a picture of an airplane I built. It has a wing span of 17 feet, 1 inch, length over all 12 feet, 5 inches. It is 3 feet 11 inches high and has a Maytag washing machine motor in it but it won't fly. It has taken nearly 2½ years to make it and about $25 out of my pocket book and now I don't know what to do with it. It wouldn't be safe to fly it even if it had a larger motor in it. Can you suggest anything to do with it besides taking it down and using the parts for something else?

I am sixteen years old and a junior in high school. I want to get in the flying game

(Continued on page 36)



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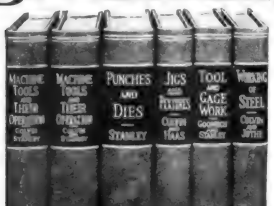

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Andy's Shop Mail Box

(Continued from page 34)

awful bad. I couldn't enter M.M. flying contest because I wasn't old enough. When I get the money I want to build a glider, and then a small plane like the Heath Parasol.

Just thought I would write and see what you thought of the plane which I call Penguin because it has wings but can't fly.

Modern Mechanics has helped me a lot in building this plane though I have only taken it a little over a year.

Yours truly,
JOHN WESLEY KUHNS.

Well John, I would say that your $25.00 has been a good investment in that it has taught you the use of tools and the elements of airplane construction. If I were you I would charge the Penguin up to experience and tackle a real crate next time—perhaps an entry for the Light Plane Contest.

Here's a picture of John Wesley Kuhns, of Delaware, Ohio, and his crate which he calls Penguin.

The old gray mare that brings the postman by the field just made a three point landing out at the mailbox, and I scuttled out for a look-see. One of the first things I opened was a crackerjack letter addressed to me, in person, by jeeminy, and here's exactly what it said:

Douglas, Ariz.

Dear Andy:

I have taken the Modern Mechanics ever since it first went on sale in this place. That was the first issue containing plans for the "Heath Parasol," and never yet have I found a magazine which contained so much real dope for so little money. I have all the magazines out in my workshop in a special cabinet with the other books of airplanes and radio, etc.

Now, since I have started the letter in this manner, I am going to introduce myself. I am Harry Lusk, age 16, Senior in High School, typomaniac and other things.

There are several things I want to have information about and that is the purpose of this letter. I have been interested in gliding almost as long as radio and that means I have been interested in it for about 5 years. Now I am going to build a glider and have been closely inspecting the plans which are pub-

(Continued on page 38)

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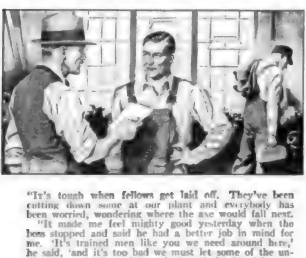

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(Continued from page 36)

lished in Modern Mechanics. Of course, you have the best plans, but heretofore, most of them have been monoplane types. I have always had a leaning for biplane types. Then you published the plans for the Lawrence Water Glider, a two-winged affair, but a lot of good it will do me—the only water in this country is in the faucet or the swimming pool. Would it be possible to put wheels on it and have an amphibian? If so, where should the tail skid be placed? At the rear end of the hull? Even if the glider would make a good amphibian, would it fly here?

. . . to which questions I must interpose an objection. I says leave the Lawrence Water Glider alone. At the altitude you live, Harry, although there is little taken off the performance of gliders because of their light wing loadings, the Lawrence will be fairly air heavy. She won't do so well with wheels and a lot of extra weight. . . .

We live at an altitude of 4800 feet and it usually takes a good airplane to fly here. Although some gliders, such as the Alexander, will fly here, I am not interested in them. My favorite is the Lawrence Glider, and if it would fly in Douglas, here, and make a good land plane it is just what I want.

I also have a small Smith Motor Wheel which I am going to soup up. I must say that the Motor Wheel which Mr. Hickman souped up to an airplane engine, does not resemble mine. However, his is probably a later type. From the photos and drawings his looked a great deal more like the Briggs-Stratton motor than the Smith. Mine does not have a flywheel mag, it has a separate one which does the work very nicely. As the flywheel weighs about 15 pounds, I would like to know if it would not be well to leave the flywheel off and to let the prop do the work of the flywheel. It would certainly save quite a bit of weight. I should also like to know if, in your opinion, the engine would keep the glider up at this altitude. . . .

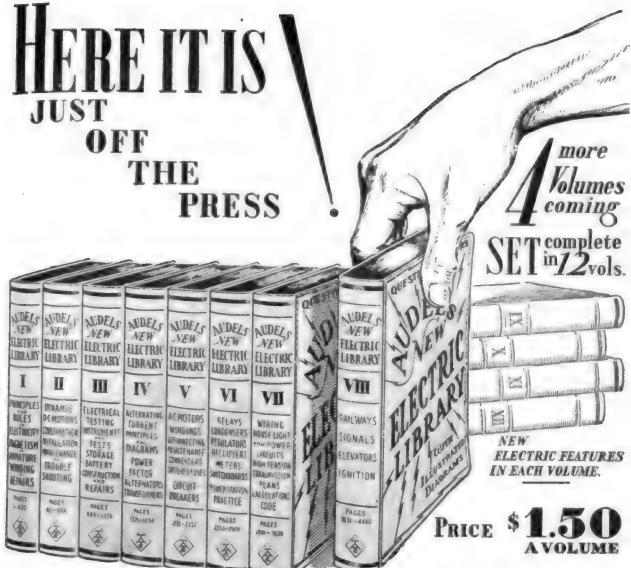
That'd have to be determined by experiment, Harry. . . .

The conversion article was well written and was almost as entertaining as any article in the M-M. I am sure that there will be a great number of enthusiasts who will want to install such an engine in their gliders. I will tell you now, so you can pass it on, that this summer I wrote to the Smith company which used to be in Milwaukee, Wis., and the letter was referred to the Briggs & Stratton Corp., for the Smith company is out of business. However, the Briggs & Stratton is such a close duplicate that it will fit in with the conversion plans. Therefore all glidermaniacs who want to put an engine on their ship will be able to get the engine from the Briggs & Stratton Company.

Speaking about gliders brings another

(Continued on page 40)

HERE IT IS JUST OFF THE PRESS



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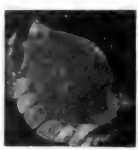

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(Continued from page 38)

thing to my mind. My manual training instructor gave me an article the other day. The article was more than an article, it was a whole newspaper. It was the American Glider News, which is published by the American Glider Co., Dearborn, Michigan.

They have kits for sale for fifty dollars and that includes everything. It is a bi-plane type, with no controls, as you hang from it until you learn the principles of control. Then you add the controls and landing gear, then fuselage and motor and in the end you have a complete light plane. The complete outfit costs 300 dollars, including the engine. Here is the point. Find out about those engines and perhaps some glider fans can get them for their gliders.

What is pitch? I have read many airplane books in the school and city libraries and not once have I come across the definition of the word, although they all use it. That may be a dumb question to ask, but what is it?

Sincerely yours,
HARRY LUSK.

Well, that isn't a dumb question, no sir. It takes courage to ask questions which seem obvious to others, but which you don't understand yourself. Such a spirit shows the true inquiring mind which makes real scientists. Pitch, Harry, is the amount of lead, or blade angle, which a prop has. It is another name for saying the amount of travel a blade would have if it were screwing its way through a solid. Four feet pitch means that the prop is cut to travel through four feet of air at every revolution. Of course it doesn't because there is a lot of slip, but that's the theory of it, anyway.

And by the way, wasn't that last letter a wagon load? And it was cut almost in half at that. Hereafter I'm going to limit letters published here to 300 words, because I always have more left over than I can possibly run. This will give more of you fellows a chance. And remember, if your letter has to be crowded out it will be answered personally—if you enclose a stamped and addressed envelope.

Well, Gang, I think I've stuck to my resolution pretty well this month. You've had nothing but letters with just enough of my lingo to kinda tie 'em together. If you'd rather hear me spout, let me know.

And in parting let me say that the Light Plane Contest is rapidly drawing to a close. Somebody's going to win that hundred smackers and it might as well be you. This is just to remind you so you can get those snaps in the mail in time. So long!

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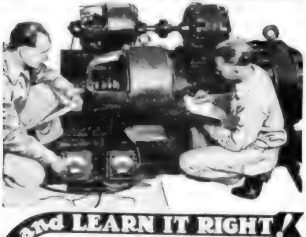

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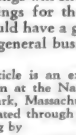

Now is the Time to Advertise More, says ROGER BABSON

A YEAR ago today a financial writer stated that all parts of the country were optimistic excepting Babson Park, which had the "blues." Today I should say that most parts of the country have the "blues" while Babson Park is optimistic.

My reason for this statement is as follows: During the past year consumption has fallen off only about 10 per cent, taking all lines of industries and all sections of the country, but production has fallen off 20 per cent, and the transportation of goods has fallen off 30 per cent. This means that the inventories of manufacturers, jobbers and retailers are becoming abnormally low. If consumption, production and transportation had fallen off about the same percentage, there might be no logical reason for improving business this fall. Under the existing circumstances, however, it is very possible that there may soon be a stampede of orders and congestion of freight in certain lines and sections. I am making no forecast as to 1931, which may average to be a quiet and uneventful year; but I certainly am optimistic regarding this fall. It is just as evident today that business is now bound to improve as it was evident a year ago that the high pace of early 1929 could not be kept up.

During the past eight months the declines in commodities and investments have been rapid and abrupt; many are now at a level from which it would be easy to build up a rising market. Investors like to have current earnings to show an improvement over previous years. Many companies are rapidly approaching a point where this will be possible. The mail order companies, the baking companies, and even possibly the aviation companies will soon be at a point where the new earnings will show an improvement over the earnings for the same period of 1929. This should have a good psychological effect on both general business and the stock market.

This article is an excerpt from an address by Mr. Babson at the National Business Conference, Babson Park, Massachusetts, September 10, 1930. It is reprinted through the courtesy of Advertising and Selling by

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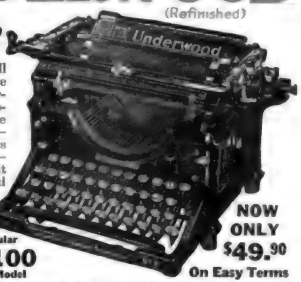

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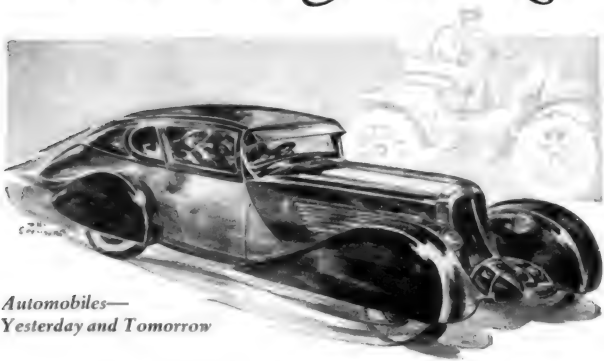


Automobiles—
Yesterday and Tomorrow

The automobile industry is on the verge of a revolution in design which will make tomorrow's cars radically different from the present models. Amazing new trends in automotive engineering, affecting every American who owns a car, are fascinatingly set forth in this prophetic article.

THE automobile world—after eight or ten years of quiet and orderly development—is on the threshold of a period of radical change and improvement.

That, in a sentence, is the big news on the eve of the 1931 automobile shows.

Three things in the season of 1929-1930 forecast a new period of development. The first was the commercial introduction of the front wheel drive principle. The second—foretold by Fred Duesenberg in MODERN MECHANICS last April—was the appearance in early summer of free wheeling on cars of one make. And the third was the introduction by an American licensee of the British "Baby Austin," in size about midway between a perambulator and a flivver.

Reports from every automobile plant in the late summer showed feverish activity in the design department, and even more than the usual amount of secrecy. As late as the last of October one company which operates several subsidiary plants, each making a different car, was declaring it did not know what it would show at the New York exhibition in January and the Chicago show the following month. Another company has developed a 16-cylinder car which will be shown at the shows for the first time. This makes two 16-cylinder cars on the American market.

And that statement probably was true. But the factories had several different cars built and was simply holding back to see what competitors might be doing.

From the maze of rumors floating around the auto industry it seems safe to predict that no less than six companies have built front wheel drive cars in the last year. One great auto group is said to be experimenting with no less than four different cars of this type.

Whether all, or any of them, will make their debut at the show, only time and tests can tell.

When Studebaker introduced free wheeling in the early summer it stole a march on the rest of the industry. At least two other

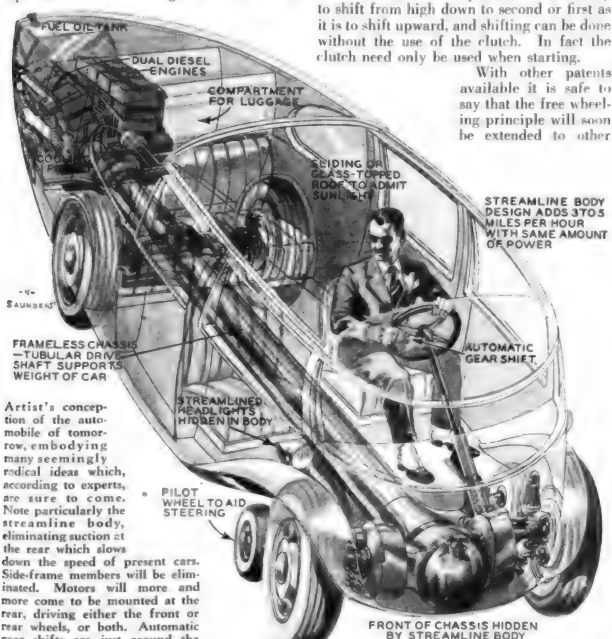
Car Look Like?

by JAY EARLE MILLER

companies had been testing free wheeling devices last winter and in the early spring, with equipment designed under other patents than those used by Studebaker. Free wheeling, as Fred Duesenberg, the famous auto designer, explained in MODERN MECHANICS of last April, is to the automobile what the coaster brake was to the bicycle.

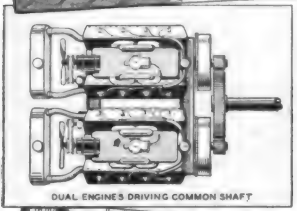
In the early days of the bicycle the engine —represented by the rider's legs—pushed the machine up the hills and continued to operate on the down grades. When the coaster brake came along the human engine pushed the load up grade, and then rested and saved its energy while coasting down. The free wheeling device, which is built into the transmission behind the gear box, does just that. As soon as car momentum exceeds engine speed the car coasts, instead of turning the engine over against compression, in the same way that the first bicycles turned the rider's legs. Naturally there is a saving in gasoline and a saving in wear and tear. And—not the least important—it is as easy to shift from high down to second or first as it is to shift upward, and shifting can be done without the use of the clutch. In fact the clutch need only be used when starting.

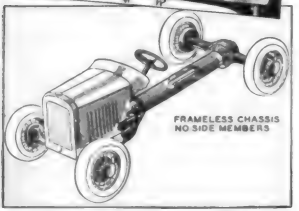
With other patents available it is safe to say that the free wheeling principle will soon be extended to other



Artist's conception of the automobile of tomorrow, embodying many seemingly radical ideas which, according to experts, are sure to come. Note particularly the streamline body, eliminating suction at the rear which slows down the speed of present cars. Side-frame members will be eliminated. Motors will more and more come to be mounted at the rear, driving either the front or rear wheels, or both. Automatic gear shifts are just around the corner on a number of new cars.

Showing how streamlining is carried out in the new Duesenberg car. Note the fishtail molding at the rear, which smooths out the air flow and increases car speed by eliminating drag of suction.





Trends in automotive design presented in graphic form. Automatic gear shifts are coming within a few months; dual engines driving a common shaft, rather than multiple-cylinder single motors, are being experimented with by European engineers.

makes of cars. Aside from that the things which have engrossed automobile manufacturers' attention this summer include:

Lighter cars, made possible by more extensive use of aluminum alloys, both for bodies and in engine and other parts.

Elimination of gear shifting.

Better body design, tending toward streamlining, to cut down wind resistance, giving either more speed or decreased gas consumption.

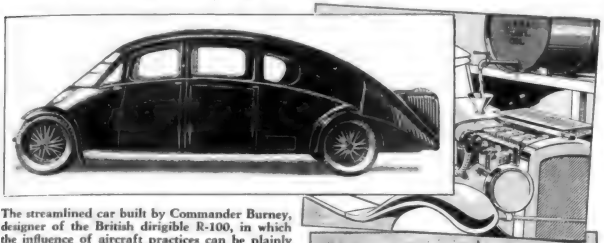
Experiments in Germany just after the war showed that the ideal design for an automobile would be the so-called "tear drop", rounded in front and trailing away to a thin edge in the rear—the most perfect streamline shape. To apply it in its best form to an automobile the engine should be located at the rear, in order to utilize the large front section for passenger space. Several cars were built in Germany along these lines, principally as the result of experimental work done by the Rohrbach brothers, famous for their all-metal airplanes. A few were imported to this country, but the design did not take hold and eventually disappeared.

It was revived this summer in England, however, by no less a person than Sir Charles Denistoun Burney, the head of the company which built the airship R-100, which made a trip during the summer to Montreal and other Canadian and American border points.

Sir Charles built up several luxurious cars to this design and a company has been organized to manufacture them in England. Despite the limitations of a streamlined body and their low overall height, they have ample room for seven passengers.

Aside from their tear drop lines they are chiefly notable for their clean exterior. The

Autos Five Years Hence Will Bear Slight Resemblance to Present Cars



The streamlined car built by Commander Burney, designer of the British dirigible R-100, in which the influence of aircraft practices can be plainly seen. Note the motor and radiator at the rear.

headlights are built into the body lines and the two spare wheels and tires are carried within the doors of the rear compartment, thus eliminating the wind resistance due to ordinary side wheel mounts.

The front fenders, instead of projecting from the body, are very small, attached to the wheels, and turn with them, so that the total wind resistance of the wheel and fender is but little more than that of the wheel alone. The rear fenders are practically all concealed within the body lines.

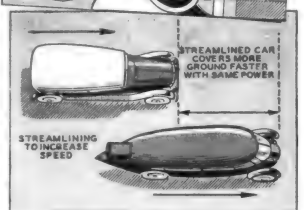
Because of the narrow front of the body, made possible by the absence of an engine, the front wheels can turn fifty degrees, enabling the car to turn in a very small radius.

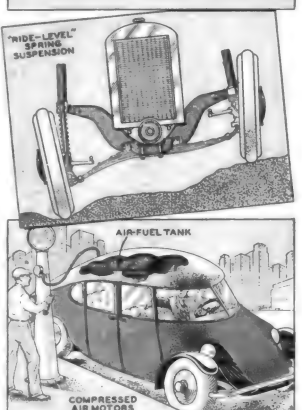
Tests are said to show that the car can operate at a given speed with one-half the power required to move a car of ordinary design, and at a saving of 50 percent of the usual gas consumption.

The effect of wind resistance has not been given much consideration by automobile designers. Their method of increasing speed has been to increase the power, and therefore the cost of operation. Beyond speeds of 60 to 75 miles an hour, however, the rising curve of gas consumption has assumed such proportions as to become almost prohibitive for any but the very rich. A high powered American car which has a top speed of about 120 miles an hour gets but four miles to the gallon as it nears that speed.

Airplane and airship designers, such as Burney, have appreciated the fact, which automobile designers have ignored, that the top speed of a car is the point at which the wind resistance plus road resistance equals the power transmitted to the wheels. The

(Continued on page 206)





Diesel engines have already been used in experimental cars, and will soon be commercially produced. Compressed air motors are being experimented with by a prominent American car builder.

A huge 32-passenger liner of the Western Air Express flying on its daily schedule over the desert.

with AVIATION!

An air liner soaring over the California mountains.

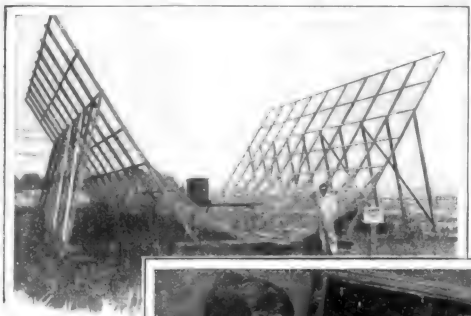
by MAJOR H. H. ARNOLD

Here's the answer to Bogart Rogers' recent article, "What's the Matter With Aviation?" which appeared in a national weekly, and in which the author branded aviation a dismal failure. Major Arnold, an old timer who taught war-birds how to fly, proves here that despite general depression, the aviation industry is on a firm foundation. What is your opinion?

TODAY this country, in fact the greater part of the world, is passing through a period of depression. Millions of people are out of work. stocks hit new lows daily. All industries have had to curtail their production. People everywhere have had to economize. What used to be considered luxuries are far beyond the reach of most people and necessities, in many cases, are becoming luxuries. With these conditions existing someone asks the question, "What's the matter with aviation?" Why not ask the question, "What's the matter with the automobile industry?" We know that automobile factories have materially cut down their production; auto stocks on Wall Street reach new lows daily; dividends come with increasing irregularity and agencies have the floors of their show

Major
H. H. Arnold

The author of this article is well known to readers of MODERN MECHANICS AND INVENTIONS, since he has conducted the Plane Talk department since the first issue of the magazine. Major Arnold served as Assistant Chief of the entire American Air Service with the rank of Colonel during the World War. Later he became Chief of the 9th Corps Area. He was one of the first Army pilots and instructors, and in fact is one of the first in the world to learn to fly, having received his instruction from Wright Brothers in 1910.



The perpendicular radio beacon which informs aviators when they're over the Alhambra airport regardless of fog.

The mechanism of the radio telephone, with which all of the Western Express mail planes are provided.

rooms filled with cars with no purchasers. Second hand cars are a drug on the market and many people are compelled to keep their cars at home in their garages. In fact, the automobile and the aviation industry have both slowed up. However, let's get down to the meat of the problem and find out what, if anything, is the matter with aviation. Prior to, say, May, 1927, the aviation industry was having hard sledding. There were very few air transport lines operating, and literally speaking, there was no demand on the factories for new airplanes other than by the Army and Navy. The traveling public made little if any use of the few air lines which were operating.

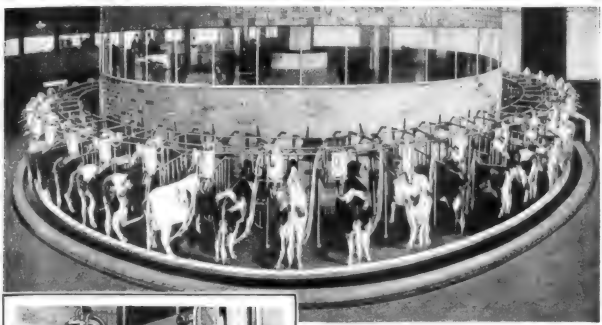
In May, 1927, Col. Lindbergh made his world famous flight from New York to Paris. Other aviators followed his example with equally daring flights across the Atlantic and Pacific and as might well have been expected, considering the lack of preparation, poor equipment used, the limited knowledge of aerial navigation and the long over-water hop, there were an appalling number of disasters. Many of them were absolutely unnecessary but as long as men are men such accidents will occur.

Even the most ardent aviation enthusiast balked at making claims that these flights proved that aerial transoceanic flights

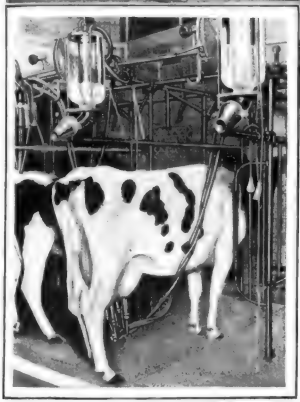
(Cont'd on p. 172)

A new super-beacon for airports which sends numerous beams of red and white lights into the air to aid flyers in penetrating fog.

"Rotolactor" Milks 50 Cows in 12 Minutes



The "Rotolactor," shown above, consists of a circular platform which makes one revolution each 12½ minutes, during which time the cow is milked. 1680 cows are milked thrice daily by this method.



Each cow steps into a stall where a milking machine is attached to her udders, as shown above. The milk is drawn into glass containers overhead, and passes thence through metal tubes to a building known as the "lactorium," where the milk is prepared and bottled in record time. Each day each animal is examined for any signs of disease by veterinarians, and a careful record of the milk output kept by means of the graduated glass containers in the stalls. The "rotolactor" is far more sanitary and speedy in its operation than any method hitherto employed.

MILKING fifty cows in twelve and a half minutes is the feat performed by a newly devised mechanical milking machine, which is now being employed by the Walker-Bordon Laboratories, of Plainsbury, New Jersey, to milk thrice daily the 1,680 cows owned by the gigantic dairy. The machine, which is called a "Rotolactor," resembles a large merry-go-round, having a platform sixty feet in diameter, making one revolution each 12½ minutes, during which time the milking of each cow is completed.

As the "Rotolactor" revolves, the cows step in turn upon the platform, receive their baths, and are then connected up with the automatic milking machine. At the end of each revolution the cow steps off the platform and returns unguided to her stall in the cow barn.

After the milk has been drawn by electricity into the sealed glass container above the cow's head, it is carried thence to the weighing and recording device. From this point it is carried to an adjoining room, where it is cooled and bottled in record-breaking time. The milk is never touched by human hands or allowed to come into contact with the air. This prevents premature spoiling.

Doctor Builds 'Health Home' With Ultra Violet Ray Glass

The unique "health home," owned by Dr. Lovell, of Los Angeles.

DR. Philip Lovell, M.D., noted Los Angeles physician, has one of the most unique homes in Southern California. Designed and equipped to keep its occupants in the best of health, it is constructed of steel, concrete, and glass, which is of the ultra-violet ray quality.

There is an inside living room and outside sleeping porch for every member of the family. The bathrooms are of glass, with built-in fixtures, and are equipped with showers, douches and sprays. The kitchen is ultra-modern, being equipped with electric dishwasher, bakelite workboards and tables.

Equipment for all kinds of sports is also provided. There is a gymnasium with complete equipment, and handball, basketball, and tennis courts.

New Car Travels on Road or Rails

A NEW vehicle which will call for commuters at their front doors, climb on the tracks at the railway station for the trip to the city, and then climb off again when the city is reached and carry its passengers through the streets to their destinations is being tried out in England. The vehicle possesses two sets of wheels. One set is provided with pneumatic tires for road travel like an ordinary bus, while the other is equipped with steel tires and flanges for travel on rails. Power is provided by a gasoline engine like that of an automobile truck. The new car has proved popular with passengers.

Salt and Pepper Shaker in One

This handy combination shaker holds pepper in one side and salt in other.

HOUSEWIVES will welcome the new combination salt and pepper shaker recently developed by a German inventor. The device, shown in the photo at the left, consists of a small glass jar divided into two compartments. The sprinkling holes are placed side by side at the top and covered by flaps.

X-Ray Reveals Fit of New Shoes

This new X-ray machine reveals to customer any constricted joints or cramped toes in new shoes.

THERE is no longer any cause for doubt as to whether a shoe fits you when you purchase it, for an X-ray machine has been devised for installation in shoe stores that reveals immediately any cramping of the foot.

New Overhead Projector Simplifies the Work of Lecturers

A NEW projector which enables an instructor or lecturer to sit at his desk, facing forward, and point out without turning around various features of a scene being shown on the screen behind him has just been developed.

The lecture-operator sees the picture on the slides which he inserts in the projector in front of him, as shown in the photo at the right. In pointing out a special feature on the picture he simply uses his pencil to point out a picture on the slide, which is then projected overhead and onto the screen. Changing the slides is an extremely simple operation.

The new overhead projector is operated by speaker as shown.

Automat Vends Lighted Cigarette

A NEW automatic device recently introduced by a London manufacturer not only delivers a fag when you put a penny in the slot, but lights it as well. The fag delivered by the cigarette automat is lighted by means of electricity and does the work within five seconds after you insert the penny in the slot. The photo below shows a young lady receiving a lighted cigarette from the machine.

This device delivers a lighted cigarette in five seconds when a penny is inserted in the slot. The cigarette is passed over a cigar lighter.

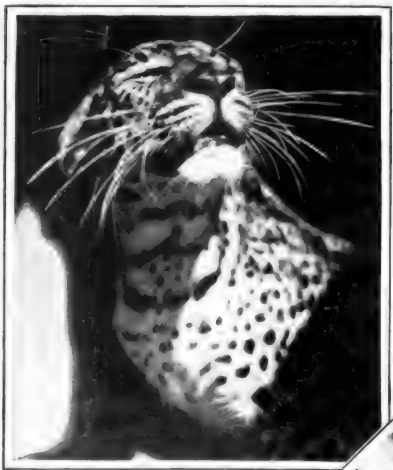
Wire Screen Aid Plants' Growth

WIRE screens for gardens similar to the fly screens used in windows, placed on one or two sides of fruit trees, flowers or vegetables but not surrounding them completely, are advocated by a German engineer, as a cheap substitute for fertilizers. Merely to erect a wire screen a few feet high alongside a row, for example, of young fruit trees or currant bushes will make these plants grow at least fifty per cent faster, it is announced. This will also induce the mature plants to produce more and better fruit.

The reason for this, plant physiologists believe, is that the wire screen lets gentle air currents pass through it, but keeps back wind. Virtually all plants lose water continually from their leaves, much as human beings perspire through the skin. The rate at which this water is lost has much to do with the plant's health and growth.

Strong winds are almost as powerful drying agents as desert heat. Plants exposed to wind tend to lose too much water and to grow slowly. Decreasing this wind by the wire screens lessens the too-great water loss.

Moving the JUNGLE



Wild animals with insides of wood and sculptured clay, mounted in natural attitudes and placed against a background of jungle scenery in which foliage and shrubs are reproduced out of plaster and spun glass with such faithfulness that the illusion is perfect, bring distant African and Asiatic jungles as close to home as the nearest natural history museum. How the skill of museum artists re-creates the jungle indoors is fascinatingly told in this article.

"Spots," a young leopard, terror of the jungle.

REPRODUCING and preserving jungle life for museum exhibits is one of the most unique professions in the world. One gets a fair idea about the value of this work when one learns that a single exhibit showing a lair of snarling lions costs from $10,000 to $50,000.

At the American Museum of Natural History in New York City there were fifty men occupied last Fall with the completion of the South Asiatic Hall. Most of them were either artists or explorers. James L. Clark, the assistant director of the Museum, in charge of the work in that department, is both an explorer and sculptor of note.

The Asiatic chamber was completed recently. Its realism was so striking that the visitor was compelled to pinch himself and look out of the window at the rooftops of neighboring buildings to reassure himself that he was not inadvertently trapped by a couple of ferocious tigers and a herd of wild water buffalo.

A field worker in the jungle taking plaster casts of leaves. Photos used with this article are reproduced through the courtesy of the American Museum of Natural History.

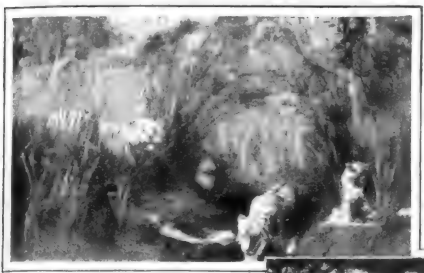
Says James L. Clark:

"That the natural history museum of today is increasingly attractive and more and more recognized as a community asset is due

INDOORS

How Artists Re-Create Jungle Scenes

by ALFRED ALBELLI



Tigers at a water pool. This natural-appearing jungle scene is typical of the museum exhibits, and represents an expenditure in the neighborhood of $50,000.

Photo of lions taken in the field, used by artists in studying the anatomy of the animal so that mounting will be perfect.

Artist sketching a jungle scene to be reproduced.

in large measure to a revolution in the display of museum material, which has taken exhibits out of the depressing sawdust doll class into the realm of art, and added alike to their appeal, their scientific exactness, and to their educational value."

This approach to perfection in the transplanting of the jungle is not solely the work of the talented artist, but also one finds that numbered in the group of fifty persons who are continuously engaged in duplicating jungle life are skillful artisans, resourceful workers in metal, wood, concrete and stone. Their jobs range from remodelling a microscopic organism to the life-size reconstruction of a whale.

In these days when the making of the habitat groups costs just as much as the expenses of the entire expedition to get the material on location, one looks back with a conscious twinkle in one's eye at the day when one walked through a museum and noticed that the seam on an elephant had broken and that the stuffings were popping out. In those days little regard was shown for life-like poses—the skins were merely stuffed, and that was the end of it.

But today, with the art of preservation reaching its apex in the recent Museum of Natural History achievements, one finds that the animals reproduced have subtleties of form, muscles ripple under the skin and possess all the evidences of power and of grace. In other words, they are "alive."

Special expeditions have gone forth to gather the material necessary for the recreation of this flora and fauna in the museum's halls. Besides the gunners, the typical expe-

Processes in mounting a lion. In order, photos show: Leg bones and skull mounted on frame; body being built up with clay. Plaster mould of body being cleaned. The clay body itself with a half-section of the mold removed. Another view of the clay body, showing how the plaster mold is built up around it. The manikin of the animal is later rebuilt inside this mold.

ditionary force includes a scientist explorer, artists, architects and an expert cameraman. What the human eye did not capture, the camera's lens was sure to get. This same troupe of men would undertake the reproduction work on returning to New York.

"No one could possibly recreate these beasts, as they are found in their native ranges," explained Mr. Clark, "unless he had seen and studied their rounded, subtle forms under all conditions of their daily life.

"Nor could an artist paint the superb backgrounds which enhance all recent groups, unless he too had seen and absorbed the spirit of the veldt, of the jungle, or of the desert in which the animals roam.

"Immediately the selected specimens are shot, each item of information that will assist in reconstruction in the American Museum studios is permanently recorded.

"In the most recent instance, some seventy tape measurements were made of a tiger. Almost endless details are recorded in sketches, and casts are often resorted to. Meanwhile the camera has been making its own record, not only of the animal taken, but of his brothers and sisters in life."

Not only is the captured animal's carcass shipped back to the museum's tannery, but artists record on their canvases the foliage and flowers and the brush-wood and the sand. Samples of rocks and soil are sent back to the studios. So exact is the work that individual leaves and buds are noted for reproduction.

Many of these accessories are dried and shipped back, but the leaves and fleshy plants are made over in wax, glass and celluloid while the rocks are reproduced in plaster.

In the Natural History Museum's jungle model factory, skins are tanned to a soft and durable flexibility while artists set to work on their models of clay.

Clay forms the most ductile and expedient element for the fashioning of these models. Its flaccid qualities make it possible for the artist to work with, in view of the constant check he must make of measurements, photographs and sketches.

In describing the process of reproducing jungle creatures, Mr. Clark said:

"The model satisfactorily completed, a plaster cast is made, inside which are built up layer by layer sections of maché and wire mesh which are later joined. This thin but enduring shell or manikin, when removed, exactly duplicates the clay model. Upon this manikin is applied the tanned skin.

"Meanwhile, in a broad recess of the exhibition hall, the foundation will have been laid, the rock work set, and the larger trees and other objects put in their determined places.

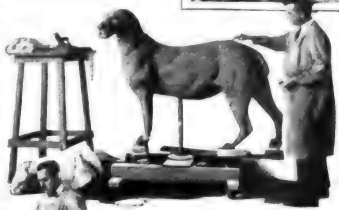
"The artist, with his field sketches, and a vivid memory of field observations, is well along with the broad panoramic painting which will be the background for the whole scene and provide its general atmosphere.

"And in a half dozen workrooms the artisans in glass and wax and fabrics have been producing in infinite detail leaves, flowers and all the hundreds of nature's smaller bits that lend conviction to the whole.

"When all is brought together in accordance with an original sketch model, the lighting worked out, and the great plate glass window sealed into place, we have a habitat group which is literally a section of pulsing wild life transported almost bodily from the field.

"The South Asiatic Hall represents expenditures of hundreds of thousands of dollars," said Mr. Clark, "yet it is well worth the expenditures of time and money in the sheer pleasure which their beauty and interest afford."

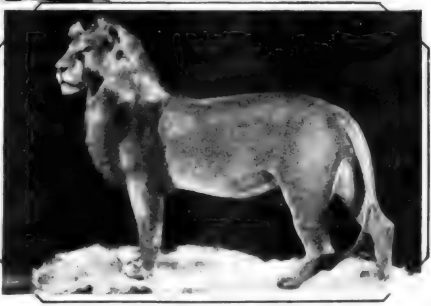
For these particular exhibits, the late Col. J. C. Faunthorpe and Arthur S. Vernay spent eleven arduous years collecting in the field and several years of preparing and mounting groups.



Above—One-half of the completed manikin, built inside the mold, is shown being removed. The manikin is a thin shell not over an eighth of an inch thick, and is reinforced with wooden cross pieces.

At left—Sculpturing the anatomy of the lion as it would be without the skin.

Applying the skin to the manikin. It is arranged in all its details before the adhesive which secures it is allowed to dry.



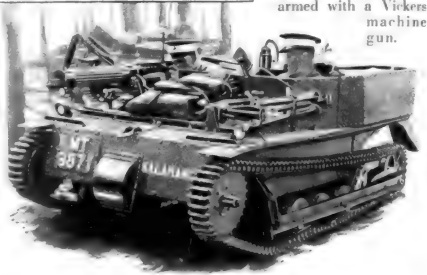
The finished specimen. Hundreds of sketches and photographs and scores of plaster casts entered into the perfection of this fine model.

Britain Demonstrates New Units in Mechanized Army

This tank is equipped with a small cannon for use against field fortifications or similar machines of the enemy.

here are the latest developments for obtaining the maximum amount of offensive power with the minimum number of men. Both of these war chariots were exhibited at Aldershot for the first time at a recent conference of Dominion premiers. The top photo is a heavy tank armed with a three-pounder cannon, while below is shown a light two-man tank capable of a speed of 40 miles an hour and armed with a Vickers machine gun.

ALTHOUGH Great Britain, aside from Germany who was forced to disarm after the Versailles Treaty, maintains the smallest standing army of any of the great European powers, this army is rapidly becoming mechanized, stress being placed on offensive weapons. The two tanks which are shown



Companies of these light, high-speed tanks will no doubt take the place of cavalry in the next war.

Indicates Headlamp Operation

Courtesy Automotive Daily News

The arrow points to the new headlamp Tell-Tale.

DR. W. Kennedy, a Toronto physician, has invented a decorative little device for attaching on top of the headlamps to indicate to the driver whether or not they are operating. The metal maple-leaves, set out from the lamps, and their backs are illuminated from the reflected light.

Well Casing of Concrete Pipe

IN La Ceiba, Honduras, one of the banana companies that had to sink several wells recently used regular concrete pipe, 36 inches in diameter and in two-foot sections for casings. As many sections of this pipe as were needed were sunk.

For a top to the well a concrete cover was cast with a groove running around the under surface which exactly fit over the groove on the exposed section of the top piece of pipe. This cover was air tight and vermin proof and along with the concrete pipe sections served very well.

This is the first time that wells have been cased by this particular method, but the practice will no doubt become popular.

The FREAK of the Month ~ No. 3

The Rotor Airship

The oddest contraption which has been brought to our attention this month is the rotor airplane designed by Ernst Zeuzem, of Frankfort-on-Main, Germany. The inventor's model is shown in the inset, while above is an artist's conception of how the full-size plane would appear in the air. Each of the four rotors will be driven by separate motors which need not be of exceptional power. The passengers will be carried in the wing section. In spite of its odd design, the principles of this plane are sound.

Mining Gems with

Pick-axes, scoop shovels, and bare hands are the only tools employed by jewel miners in the world's richest gem-bearing country—the Pala Gem Field of southern California. Rubies, sapphires, emeralds, topazes, amethysts, opals, and scores of other precious stones lie here on the surface of the ground, and a production of $10,000 worth by one man in a day is not uncommon.

Working with barrows and shovels.

Photo above shows a section of gem-bearing matrix which gives a good idea of the profusion of valuable gems borne in a small area. These stones are found in decomposed rock and can be lifted out by hand.

THE world's largest natural gem box, held in a granite case, 35 miles wide by nearly 100 miles long, is producing thousands of carats of precious and semi-precious stones every month, through the simple medium of the scoop-shovel. Shaped roughly like an Indian scraper-stone, this area of southern California is the greatest, as well as the most varied, deposit of gems yet discovered by man. In addition to area and variety, it leads the world in value and purity of product, with the exception of the South African and Brazilian diamond fields.

Burma has its rubies, Ceylon its sapphires, South America its emeralds, and Africa its diamonds, but here in southwestern United States are found rubies, sapphires, emeralds, even small diamonds, and, in addition, fine topazes, amethysts, opals, the rare kunzite, tourmalines, rubelites, beryls, zircons, hyacinths, beautiful benitoites, chrysolites, and transparent quartz crystals of large size and great beauty—all lying in loose formation, on or near the surface of the ground. The finest specimens of the rarest known gems—kunzite, technically known as lilac spodumene—are found here and here only.

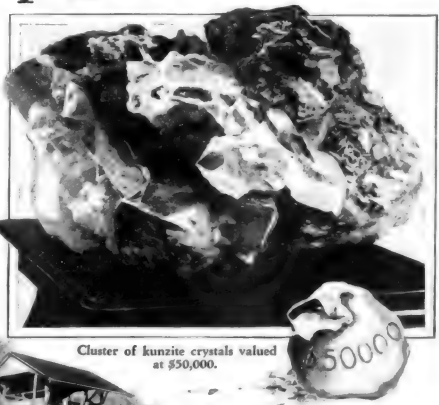
Blue topaz, as fine as any from the Urals; uncommon pink beryl; tourmaline, as deep as a pigeon-blood ruby; zircons ranging from emerald to sapphire—all have been taken from the top of this apparently inexhaustible field, into which neither tunnel nor shaft need to be run. In fact, the depth of the deposit is unknown. No attempt has been made to probe it, since more than enough gems to supply the world are on the surface. From the second day of my first working of this field, in 1903, the tourmalines alone have paid for the original cost

a Scoop Shovel

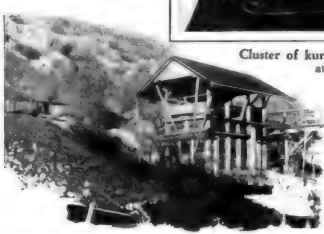
by **Frank A. Salmons**
(Discoverer of the Pala Gem Field)
As told to REINA WILES DUNN

of the mine and all operations since. Production of these beautifully colored stones ranges from $8,000 to $10,000 a month, and their numbers apparently are endless.

Four towns of considerable size—San Jacinto, Pala, Ramona and Mesa Grande—are located within this New World Golconda, which lies across the central parts of San Diego and Riverside



Cluster of kunzite crystals valued at $50,000.



Breaking and sorting shed—the only building in the Pala Field. Thousands of jewels pass through it.

counties. The greater part of this large area, 3500 square miles, has not been prospected, though all is gem-bearing, varying only in degree of abundance. The entire terrain is spotted thickly with powdered red feldspar and coarse decomposed granite, whose volcanic origin is shown by frequent walls, or dykes, of blue-gray diorite, itself a valuable ornamental building stone. The gems are found in dykes, or, occasionally, in stratified layers in the granite upthrusts. These dykes, being lighter in color, are visible for many miles, and it is estimated that less than one per cent of the precious stones contained in this area has been taken out.

Kunzite and tourmaline, the most valuable of the gems, are found in pockets, 8 to 12 inches in diameter, surrounded by white or pink chalk. Usually, these pockets may be opened and scooped out with a shovel, though now and then a blow from a pick is necessary. As a rule, a sharp shovel and a careful hand are all the tools needed to mine these gems. Often, the sharp-eyed miner will lift out four or five thousand dollars' worth of tourmaline with his unaided hand.

Beyond its size, this field gives to the world the greatest annual value in precious stones of all New World deposits except the Brazilian emerald mines. The ruby mines of Burma and the moonstone beds of Ceylon fall far behind the product of the California deposit in value, while no other known source even approaches the latter in variety of gems. In Burma and Ceylon, as well as in South Africa, armies of natives dig pits or trenches in the river beds, or carve tunnels into mountainsides to get the gems. Most of those stones have been broken away from ancient formations, carried sometimes many miles by water, and eventually left in the beds of the streams down which they rolled. As a result, they are found in the shape of pebbles, large or small,

California Has Only Field Where Rare Lilac Kunzite Stone Is Found

The photo above shows a typical jewel-bearing formation of rocks in the rich Pala Gem Field

in the gravel of the river bottoms. In the California deposits, better known as the Pala Gem Field, the stones, like diamonds, are found exactly where they were made, enclosed first in the original matrix, and then in stone, much of which has disintegrated. In this respect, the Pala field is unique, and thousands of carats of its finest and most valuable gems have been picked up on the surface.

Nearly all of the best-known gems are found here. Near San Jacinto, on the northeasterly rim of the deposit, several small diamonds have been picked up, but so far neither the clay "pipes" of South Africa, nor the placer diamond fields of South America, have been discovered, and the "white stones" found are by no means perfect. Other and less well-known semi-precious stones in profusion are here, some of them nowhere else in the world—such as the radiant pink or lilac stone known as kunzite, and the beautiful blue benitoite, sister to the sapphire in splendor and hardness. Had the Spaniards discovered this deposit, they never would have wasted time on the fabled Seven Cities of Cibola, paved with gold though they may have been, and California might still have been a Spanish province!

Here's a necklace valued at $3,000, made up of stones mined in the Pala Field.

The formation of this unique gem field is explained by Dr. Waldemar Schaller, former professor of geology at the University of California. He says that at one time the entire region was composed of graphic granite. Gradually water, filled with mineral salts, infiltrated through this granite, eventually replacing it with a crystalline formation, under stress of tremendous heat and pressure. The result is the gem deposit, a peculiar feature of which is a thin vein of the same matrix matter as that in which diamonds are embedded at Kimberley, though none of the stones have been found in it.

One ounce of "raw" kunzite yields, on the average, 60 carats of commercially valuable gem. These virtually perfect crystals, along with the other stones, are found apparently as abundant on the surface as beneath it, so the miners merely scoop out a section eight or ten feet deep, and then, when tunneling, shafting, or at least timbering, would be necessary if they remained in the same place, they merely move on to another point and remove some more of the surface of the dyke. As the South Sea islander reaches to the nearest bush and picks fruit, so the Pala gem miner merely moves to the nearest upthrust of gem-bearing dyke and shovels out a few bushels

Early Explorers of California Missed Fortunes Beneath Their Feet

Old mission in the heart of the Pala Field.

Waste rock, from which all valuable jewels have been removed, stacked in an immense pile.

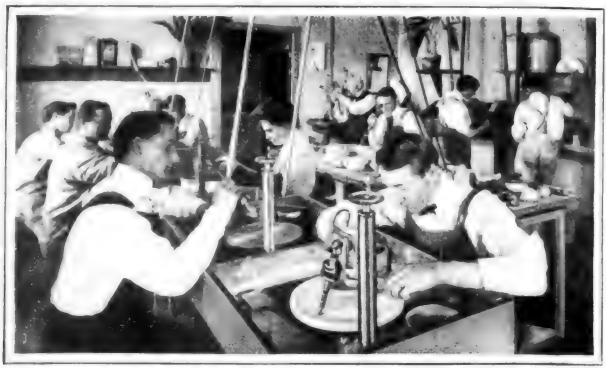
of semi-precious stones.

Apparently the earliest Indian inhabitants of the region knew of this deposit, and from it made a few arrowheads, using largely the quartz crystal. It was only rarely,

Map of California shows the location of the gem field. It is approximately 100 miles long.

An early drawing showing the effort of Henry Magee to refine quicksilver from red feldspar, which he mistook for cinnabar. He missed the millions of dollars worth of priceless gems beneath his feet. Early Spaniards searching for legendary cities of gold also missed the fabulous jewel deposits.

Jewel Cutter's Skill Needed to Bring Out Hidden Qualities in Rare Gems



All precious stones must be cut and polished before their full beauty is brought out. Each stone demands a particular type of cutting by expert lapidaries who are shown at work in the photo above.

however, that they could chip or split this crystal into shape suitable for their weapons, and such artifacts are scarce in even the best preserved of prehistoric camps. Here and there in these camps, for distances up to 50 miles from the edges of the deposit, the writer has found bits of tourmaline and kunzite, embedded in quartz crystal, seemingly picked up as curiosities by the primitives of the region. No attempt was made to make beads from any of the multi-colored stones, such as the Mojaves and the Navajos made from turquoise they took from the hills farther to the east. No turquoise has been found in the Pala Field, though so much of the area remains to be explored that no one knows what it may contain.

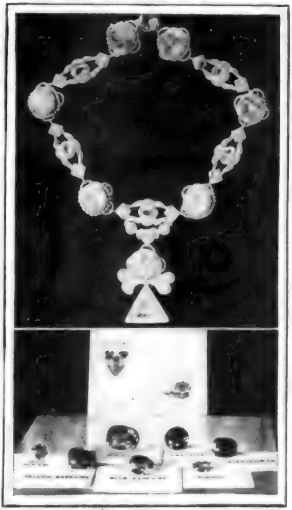
Civilization was given its first knowledge of the great deposit by one Vensuelada, an Indian hunter, early in the nineteenth century. Though the pink, red, blue and yellow stones he brought in were admired, nothing was done about the field, until shortly after the gold rush in 1850. Then Henry Magee, a prospector, staked the territory for mercury, mistaking the red, powdered feldspar for cinnabar. He abandoned his claims, throwing away a fortune. Don Tomaso Alvarado, Spanish *haciendado* of the period, next attempted to work it for building stone, believing that the large pieces of pink tourmaline he found were a new kind of marble (!). In 1903, Frank A. Salmons, present owner of the most extensive workings in the gem field, saw an iridescent pink stone on an ant hill. The stone was nearly half an inch in diameter, one of the most perfect tourmalines ever found. He looked around, saw other stones like this, and of other colors, and filed claims on the land. The present Pala Chief gem mine is the result. The center of the deposit is about 70 miles northeast of San Diego, and the altitude is 1220 feet, though all this area has been lifted and lowered twice and is now slowly rising again, so that neither the original nor the ultimate elevation can be estimated.

When the miner has shoveled his wheelbarrow full of gems in the rough, he trundles it down to a waiting motor truck, whence it is carried to the sorters, who select the crystals which are most likely to cut into perfect gems, leaving the others to be ground into smaller pieces for all manner of ornamental uses. Then the lilac kunzite, the deep blue benitoite, the varying shades of tourmaline, the blue, yellow or green zircons, and the limpid quartz crystals are taken in hand by scores of expert lapidaries, who carve and grind from them the shapes and sizes to which each rough piece is best suited.

Benitoite, the world's newest gem, was mis-

taken for sapphire when it was first seen, near San Benito Peak. It is found in transparent prisms or trigonal pyramids, ranging from deepest blue to perfect transparency. It occurs in a belt of veins of serpentine, usually associated with neptunite, a semi-precious stone, black with red reflections, and found elsewhere only in Greenland. Chemically, benitoite is a titano silicate of barium, thus differing from the sapphire, of which, by the way, the Oriental emerald is the green form. The best of the benitoites are as deeply colored and as beautiful as any sapphire, and of equal durability.

Another romantic stone is kunzite, a white to lilac-colored gem, found only in this field, and given to the world shortly after the opening of the Pala deposits in 1903. The largest kunzite so far taken out weighs 150 carats, after cutting. It is extremely brilliant, and, like the diamond, may be cut into any form desired. This white, pink and lilac gem is in reality the same stone as the dull, opaque, gray crystals found in New England and South Dakota, and known as spodumene. There is a yellow variety in Brazil and a green form, known as hiddenite, in North Carolina. The greater part of the kunzite shoveled out of the Pala deposit is in large crystals, free from flaws and perfect in color. One kunzite crystal from the Pala Chief mine weighed 24 ounces before being cut.



Top photo — necklace of rubelites with oval blue zircons on the links and clasp, and triangular blue zircon as a pendant. This necklace was made to order from gems out of the Pala Field, and brought $2,000. Lower photo—Display of rare gems from Ceylon, including alexandrite and patparagam.

Ear pendants, ring, and part of necklace of kunzite, a gem found only in the Pala Field.

Subjected to the violet ray for half a minute, kunzite becomes phosphorescent, and remains in this condition for ten minutes or more. After this "glow" has died down, if the stone be laid on an unexposed photographic plate, in a dark room, it will take a very fine and clear picture of itself. Repeated applications of the ray appear to do no harm to it.

White, yellow, blue and green topazes are found in numbers in this field, especially in the area surrounding the town of Ramona. Some of them are of large size, from two to two and one-half inches long by an inch thick. Most of these topaz crystals are wedge-shaped, and those found on the surface usually are white, becoming deeper in the various colors down to a depth of eight feet, the extent to which their deposits have been worked. More than fifty pounds of these crystals were found in one trench 20 feet long, 8 feet wide and four feet deep. Occasionally, topazes are found with green tourmaline, but as a rule, the topaz and garnet deposits, as well as the sapphires, are grouped each to itself.

Astronomers Recondition Huge Mount Wilson Telescope

The huge 5-ton mirror is lowered for resilvering into its well beneath the telescope, as shown in this unusual photo.

IN preparing for forthcoming observations of the activities of the great mass of stars that swarm above our heads, directors of the famous Mount Wilson observatory are having the huge reflector of the 100-inch telescope resilvered. In performing this task the huge 5-ton mirror is lowered into its well beneath the telescope. Two and a half hours are required for the elevating screw on which the gigantic mirror rests to make the trip each way and 24 hours are required for the entire operation.

Only the most expert men are used in reconditioning the mirror, as the least flaw would seriously upset astronomical calculations. The instrument is the most important tool yet developed for astronomical research work. The accompanying photos are the first ever obtained of the resilvering.

Highly skilled men are required in the work of resilvering the gigantic reflector. This photo shows men removing the surplus silver from the glass with a chamois to avoid scratching.

Drugless Coffee

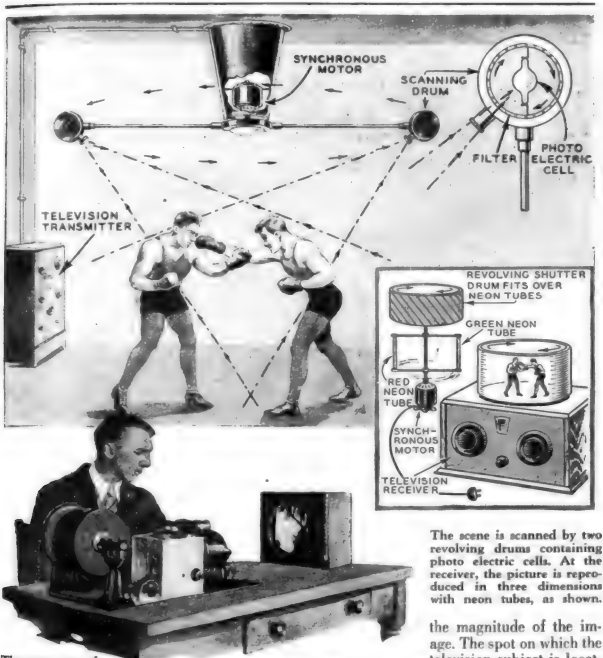
POURING cups of coffee out of the same pot, one cup containing its full complement of caffein for drinkers who want the stimulation of that alkaloid, while the next cup is entirely free of caffein, is said now to be possible as a result of the development of a new material called "Absorbo."

Absorbo is a black, paper-like material resembling thick blotting paper, its black color being due to the presence of a special kind of charcoal. The tiny microscopic particles of this charcoal have been especially "activated." manufacturers of the new material state, similar to the activation of the charcoal used to absorb poison gases in gas-masks. Accordingly, the hostess needs merely to pour the coffee through a filter made of "Absorbo," to remove the dreaded caffein.

Non-Skid Rugs Prevent Accidents

NON-SKID rugs which will prevent serious accidents resulting from falls, are being studied scientifically by the Bureau of Standards. In a recent test an ordinary rug slid down a plane tilted at 18 degrees while the non-skid rug stayed put till the polished plane was tilted to a 32 degree angle, thus proving its superiority.

Television in Three Dimensions



The scene is scanned by two revolving drums containing photo electric cells. At the receiver, the picture is reproduced in three dimensions with neon tubes, as shown.

The scene can also be reproduced on a screen by means of a television controlled projector.

A DEVICE which can produce a 360 degree picture by television through a stereoscope scanner has been invented by Leslie Gould, a radio engineer of Bridgeport, Connecticut. With Mr. Gould's television system it is possible to televise a boxing match, a play, an orchestra, or any other spectacle whose scene of action can be compressed into a reasonable space.

The new invention makes use of neon tubes of various sizes and colors, depending upon the magnitude of the image. The spot on which the television subject is located is scanned by beams from two rotating arms, as shown in the drawing above. At the extremity of each arm is a scanning drum containing a photo electric cell, which picks up the images to be televised.

The scene which is going to be televised must be flooded with a great quantity of strong light. Each electric eye catches the light reflected through the apertures in the revolving drums from the light portions of the body, and flashes to the transmitter the electric impulses set up by the variations in light.

Safe Harbors Hold Greatest

by
ALFRED ALBELLI

Fire, fog, invisible mud-banks and treacherous currents are the means by which great ocean liners are brought to destruction in crowded harbors like New York. Only skillful pilots can guide a ship through these perils, and how they sometimes fail is related in this interesting article.

$2,000,000 damage was caused when fire broke out aboard the United States Lines' steamer, "America," while she was undergoing repairs at Newport News, Va. The flames were subdued by the fireboats.

STRANGE as it may seem, the mammoth ocean liners, or trans-Atlantic ferries, as they are sometimes more aptly called, which shuttle back and forth between continents, meet more frequently with fatal disasters when safe within the confines of a sheltered harbor than when plying the ocean trade lanes, where hurricanes, icebergs, fogs, submerged derelicts and mudbanks lurk ever in the offing to send a swift ocean greyhound with her cargo of thousands of human lives to destruction at the bottom of the sea.

Ocean liners are ponderous bodies, difficult to manage in a small space, except with the aid of tugboats. When out on the open sea, a liner's skipper has ample space in which to maneuver his ship; there are hardly any uncharted mudbanks; and in case of heavy fog, the traffic is so light and fog horns so effective that there is little danger of collision.

In a crowded port, however, the conditions are different. A multitude of ships are constantly coming and going, weaving their courses crazily across each other's paths. But in certain parts of the harbor ships must keep in marked channels. If they get caught in a fog and miss the channel they will run aground on a mudbank.

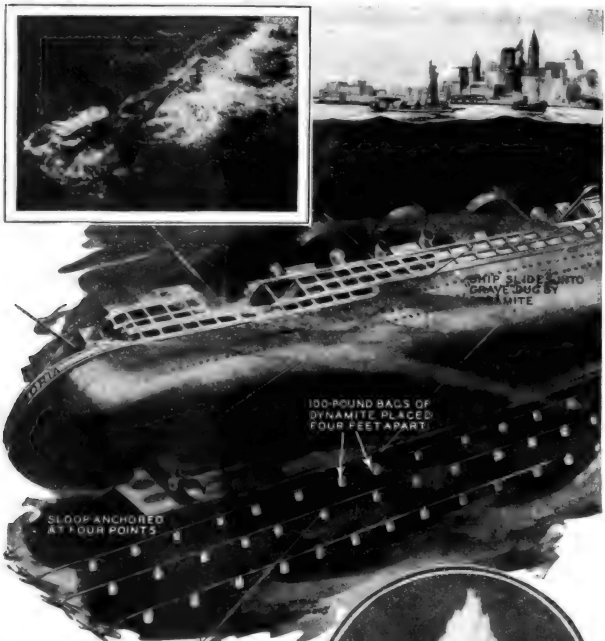
In harbors where ship traffic is heavy, fog is probably the cause of most of these disasters, with fire running a close second. Fog figuratively closes the eyes of a pilot, so that if he is to keep on schedule, as he is urged to do, he must grope his way through a maze of channels up which other ships may be steaming or in which they may be anchored waiting for the fog to lift. On he goes, till all of a sudden the vast, ghostly form of

DANGERS for Ocean Liners

Upper left photo—German steamer "Dendorah," which was sunk in a collision in a fog in the harbor of Santos, Brazil. Upper right—Huge rent in the bow of the tanker "W. W. Bruce," caused by collision with "S. S. Scottish Maiden" off Barnegat Lightship in fog. Right—German liner "Muenchen" afire at New York pier.

Most of the disasters in crowded ports are caused by fog. The pilot cannot see the vessel his ship is bearing down upon until it is too late. The above drawing gives an idea how such accidents occur.

50,000 Lbs. of Dynamite Dig Grave Beneath the Sea for "Fort Victoria"



The charges for digging the grave for the sunken "Fort Victoria" were beaded on cables lain as shown in the drawing above. Upper photo shows vessel lying awash, forming a menace to navigation.

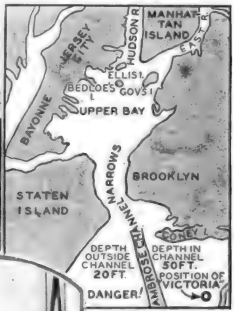
another ship looms out of the mist and—crash—there is confusion, frantic yells, panic—another sea disaster.

Fire takes its toll of ships in which cargo subject to spontaneous combustion has been stowed in such a manner that air cannot circulate freely. With the necessity to batten down all cargo hatches to make them as watertight as possible, it frequently happens that air is excluded beyond safe limits as well. Then, when everything seems quiet and safe,

The mammoth geyser created by the explosion of the 50,000 pounds of dynamite used in planting the "Fort Victoria" is shown in the photo above.

Great Ocean Liners Keep in Deep Channels to Avoid Running Aground

The dynamite charges were set off by means of a cable bisecting the four parallel cables below and leading up to the sloop, where the fuse was ignited for the blast.



New York Harbor, one of the most crowded ports in the world. Sludge has filled this harbor to such an extent that ships must stick to the channel or run aground.

This photo shows passengers taking to the life boats after the crash between the "Fort Victoria" and "Algonquin."

there occurs an ear splitting roar from an explosion that rips the decks wide open. In a few minutes the ship becomes a mass of flame and sinks.

Of all the seaports which dot the North American continent, New York best presents the hazards which confront a big boat during those minutes spent leaving the pier or coming up the harbor to be lodged into her berth. Over 1,000 boats of all descriptions ply the waters adjacent to Manhattan Island daily. This locale is the scene of collisions, fires, explosions, sinkings and ships running aground.

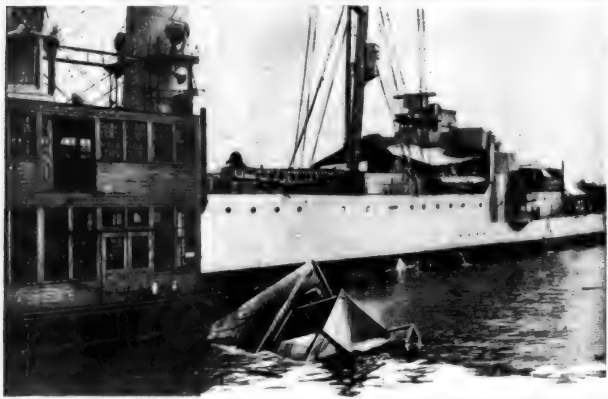
One of the most astounding disasters in maritime history occurred shortly after 9 a. m. on the morning of last February 11, when the North German Lloyd's 13,483-ton liner, *Muenchen*, had slid placidly into her pier on the Hudson River side of New York City. Just as the last passenger had gone down the gangplank, a terrific explosion detonated from hatch No. 6.

This was instantly followed by a series of smaller explosions. The rumbling was heard for blocks in downtown Manhattan. It seemed that the entire ship would be blown to pieces and that the lives of hundreds would be snuffed out on the giant vessel.

Five alarms were sent in, bringing every piece of fire-fighting apparatus in the borough to the scene. The pilot of one of the fire-boats was blown into the river by one of the blasts. The fierce heat which engulfed the area into which he had been swept prevented his rescue.

Streams of water proved futile against the clouds of flames which enveloped the *Muenchen* from stem to stern. By 12 o'clock the burning ship was listing heavily. In another half hour the $3,000,000 boat sank out of sight.

The cause of the explosions was somewhat of a mystery at first, but investigation later revealed that the *Muenchen* was carrying a



A terrific explosion was narrowly averted when the "S. S. Addison City" became unmanageable in Boston Harbor and rammed a navy lighter which was loaded with six-inch shells. The lighter sank.

cargo of potash and that combustion had set in by some unfathomable manner.

Fortunately, the explosions did not commence until all the passengers had disembarked. What toll of life might have been taken had the blasts occurred midway up the bay is frightful to contemplate.

The French Line's mammoth passenger, *Paris*, has had its difficulties in running the mythical gauntlet of New York harbor. She has been in harbor mishaps twice in recent years. The first happened in October, 1927, when she was going down the channel, Europe-bound, at 1:30 in the morning. A string of barges cut across her bow, causing the pilot to swerve to the right.

Then as she veered, an anchored ship rose suddenly, like an apparition, out of the darkness. The pilot quickly turned his boat again so as to pass between this other vessel and the barges. But, much to his amazement, another ship which had been hidden by the one which he missed, suddenly loomed up. A crash was inevitable. The *Paris* rammed into this other vessel, which was the *Bessengen*, resulting in the loss of six of the latter's crew.

At a later date, the *Paris* was again headed for the Atlantic when she ran aground in heavy fog on mud flats off Brooklyn. Visibility for only a half mile was possible because of the fog. The pilot thought that he had passed the final buoy in the channel and brought the boat suddenly into the soft mud which lies on both sides of the channel. The sludge which prevails in the harbor has always been a bugaboo for the mariner. It has been only recently that the state government of New York has concerned itself with the elimination of this perilous menace to navigation.

Harbor authorities also recall that one time the *Leviathan* made too wide a turn in the bend of the channel and grounded. Her hull came in contact with huge sewer pipes operated by several Jersey cities, damaging much of the engineering work connected with the system.

One of the most astounding accidents to occur in the waters of New York harbor was the crash in December, 1929, between the Furness-Bermuda steamship, *Fort Victoria*, which was outward-bound, and the Clyde liner, *Algonquin*, also going out. The colli-

sion occurred at 4 o'clock in the afternoon, when a blinding fog hung over the bay.

The *Fort Victoria* had come to a halt at the channel lightship to drop her pilot, a procedure which will be explained more in detail later. The *Algonquin* drew up to this vicinity to perform a similar task. It was at this point that the *Algonquin* rammed the *Fort Victoria* amidships, tearing a hole in the hull of the latter. The sea rushed in, flooding the engine room and cutting off the power.

Rendered powerless by collision with another ship, the oil tanker, "Lyman Stewart," shown above, was thrown helpless against the shore of the entrance to Golden Gate, San Francisco. She was a total loss.

Both ships sent out frantic wireless calls for help. An emergency dynamo was put to work on the *Fort Victoria*. Scores of boats rushed to the rescue. All the passengers and the crew were taken off the *Fort Victoria* safely. Clinging to the age-old code of the sea, the captain and twelve of his men refused to leave the ship until she was canting at a 45-degree angle and on the verge of disappearing to the bottom. A few minutes later she went down.

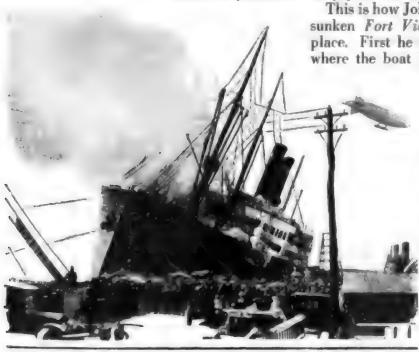
On last October 1, harbor officials decided that the partially submerged *Fort Victoria* was an actual menace to the craft plying the bay. They decided that there was only one way to free the waters of this dangerous obstacle, and that was by commissioning Charles T. Johnson, a master salvage man whose undersea exploits equal the marvels of a Jules Verne, to dig the grave for the *Fort Victoria*.

Johnson was requested to put the *Fort Victoria* anywhere so long as he put her where the hulk would be 53 feet below the water surface at low tide. For this extraordinary job, Johnson was to receive $115,000.

This is how Johnson went about putting the sunken *Fort Victoria* in her final resting-place. First he was shown the precise spot where the boat lay. Diagrams showed him her position in detail. Next he appropriated 50,000 pounds of dynamite which he handled in a small boat. If a real strong wind disturbed his cargo of explosives very much, the sunken craft might also have been the scene of his own grave.

With this load of dynamite he was to tear a pit in the mud into which the vessel would slide. The main charge was done up in 100-pound sacks. An anchor was dropped ten feet ahead, near the bow of the wrecked boat. Then

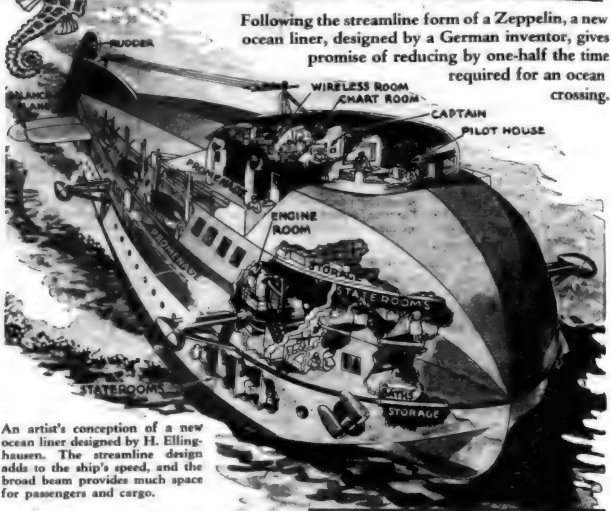
(Continued on page 178)



One dead, one missing, $6,000,000 loss, was the result of the burning of the palatial German liner, "Muenchen," at her pier in New York.

An OCEAN LINER

Following the streamline form of a Zeppelin, a new ocean liner, designed by a German inventor, gives promise of reducing by one-half the time required for an ocean crossing.



An artist's conception of a new ocean liner designed by H. Ellinghausen. The streamline design adds to the ship's speed, and the broad beam provides much space for passengers and cargo.

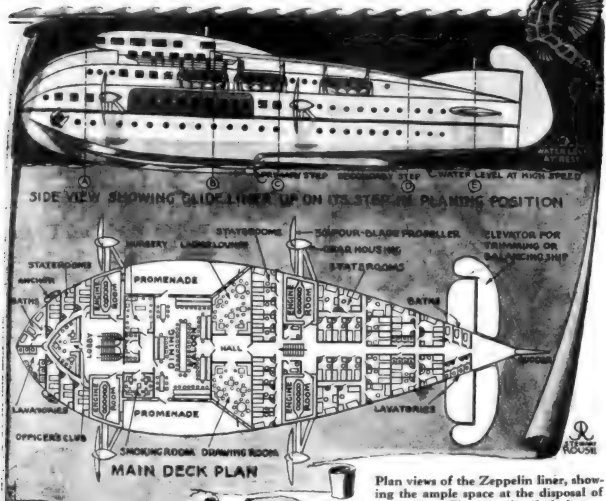
WILL the ocean liner of the future take advantage of the lessons learned by airship engineers and pattern its design after the streamlined *Graf Zeppelin, Los Angeles, R-100,* and other famous lighter-than-air craft? That such is the present tendency is indicated by the contemplated ship shown in the artist's drawing above, and depicted on this month's cover of MODERN MECHANICS AND INVENTIONS. It is the invention of H. Ellinghausen, of Bremen, Germany, who in experiments with this type of design has developed speeds well in excess of 60 miles an hour.

Advantages of such a ship are obvious. Streamline design adds to the speed without requiring increase in power. The broad, rounded design of the ship allows interior accommodations to be laid out to the best advantage, without the necessity for cramped staterooms as on the ordinary vessel. Placing the air drive propellers outside the hull enables the motors to be taken care of in a comparatively small space.

An experimental streamlined boat used by the inventor in working out the design for the liner.

There is no danger of such a ship rolling over in a heavy sea, owing to the broad V-bottom. Placing steps in the bottom, following the practice of speedboat designers, adds

Built Like a ZEPPELIN



Plan views of the Zeppelin liner, showing the ample space at the disposal of passengers. Three enclosed decks are provided for. Note the twin steps in the keel, exactly like those on racing hydroplanes, which enable the ship to rise slightly out of the water at certain speeds, thus cutting down drag of the water. A two-day crossing of the Atlantic in such a craft is within the bounds of probability.

to the speed of the craft. Promenade decks are built into the side of the ship so that the wind created by the boat's own speed will not annoy the passengers. Tail controls similar to those on an airplane are used to keep the ship on its course, but an under-water rudder can also be added to get quicker response in emergencies.

A special light metal which is the invention of Mr. Ellinghausen will be used when the ship gets under construction. He calls this metal ultralumin, and it differs from the more familiar duralumin in that it is an alloy of copper and manganese instead of magnesium and nickel. Ultralumin is corrosion proof—an important quality in a sea-going craft—and it also has easier working qualities.

The record for an Atlantic crossing is now held by the German liner *Bremen*. It is notable that the *Bremen* is the first liner whose above-water parts have been consistently streamlined. Smokestacks, masts, and other exposed objects are streamlined to such good effect that it was almost inevitable she should capture the Atlantic speed record. Speed gained by streamlining is, as the saying goes, pure velvet. Adding more power to an existing design is an old way of increasing speed —at a considerable expense for fuel.

Turn of Crank Shuffles Cards and Deals Out Bridge Hands

This device deals bridge hands mechanically.

SHUFFLING the cards and dealing four hands of bridge in 20 seconds is the remarkable achievement of the machine shown in the photo at the left, which promises to eliminate the time wasted in manual dealing of the cards. Serious-minded bridge addicts are thus enabled to play an extra round or two each evening in the same amount of time—another testimonial for American efficiency.

The shuffler is the invention of L. A. Lux, of Cleveland, Ohio, and is the first device of its kind successfully patented in this country. The cards are placed between a spring and a pair of rollers, and turning the crank whisks the cards into four separate compartments.

Sawhorse Pad Makes Work Easier

TO SIMPLIFY the effort required in sawing wood in the familiar sawhorse, take a section of old inner tube and wind it around one of the projecting prongs of the sawhorse as shown in the photo at right. This provides a thick pad against which the log rests, and prevents its turning around or slipping out of position when being sawed. Placing of the rubber pads on both prongs, or better yet on all four, will make the sawing process much pleasanter

Rubber pads on the sawhorse make woodsawing operation much easier.

Animals May Learn to Talk

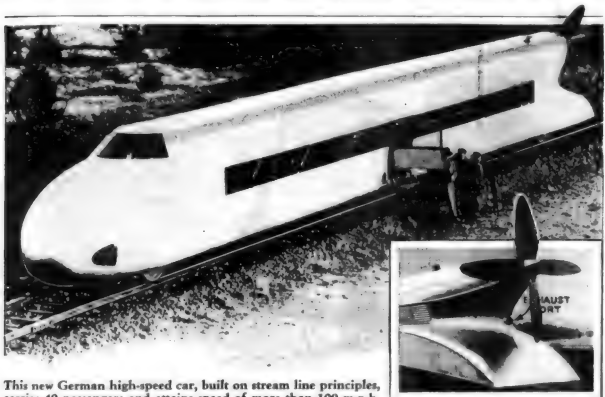
EVIDENCE that animals have the beginnings of words like those of human language has been obtained from photographs of animal sounds such as a dog's bark, taken by Dr. Bastian Schmid, of Germany.

Motorists' Wire Brush Removes Road Tar, Scrapes Carbon, Cleans Rust

A NEW handy tool for the car owner is a straight wire brush with two scrapers attached, as shown in the photo at the right. The round corner scraper is used to remove road tar and mud from under the fenders; the straight corner one for scraping carbon, cleaning cylinder heads, etc. The wire brush cleans surfaces before they are touched up, removing rust from bolts, springs, and so forth.

Wire brush and scrapers provide complete tool for cleaning all parts of a car.

New German Air-Railway Car Speeds 100 Miles Per Hour



This new German high-speed car, built on stream line principles, carries 40 passengers and attains speed of more than 100 m.p.h.

The car is driven by a 400 h.p. motor and this huge propeller.

A NEW railway car resembling a zeppelin on wheels, which holds possibilities of a new era in railway transportation has recently been tested in Germany. Utilizing the principles of streamlining throughout, the long silver monster carrying 40 passengers attained a speed of more than 100 miles per hour on a straight stretch of track, getting up full speed in slightly more than a minute. Earlier secret trials are said to have resulted in a 114 m.p.h. speed.

The car is driven by a 400 horsepower airplane motor with a propeller and weighs 20 tons. A single pair of wheels fore and aft support the body, which is eighty-five feet over all. The huge propeller, shown in the photo above, projects from a point at the stern and is slightly tilted upwards to help keep the car on the tracks. Two types of brakes, railway and automobile, are utilized to bring the monster to a smooth stop. The car is the invention of Herr Frantz Kruckenberg, director of the Traffic Experimental station, which is devoted to the study of swift, cheap transportation.

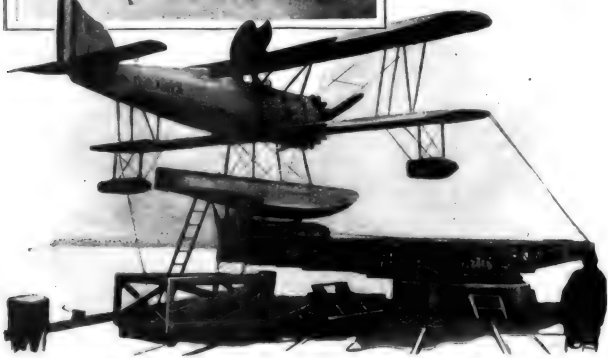
Inventor Builds Model for High Speed Sub Driven by Compressed Air

HENRY FLEUR, a San Francisco inventor, has built a six-foot model for a submarine which he expects to travel at a rate of 80 knots when submerged and 119 knots on the surface. This unique vessel uses compressed air as motive power instead of the usual twin-screw propellers. The boat is sucked forward, so to speak, at the head and pushed forward at the stern by means of a suction pump which draws the water in at the bow, carries it the length of the boat through a tube, and ejects it at the stern. This method of propulsion is expected to effect a saving.

The inventor with a six-foot model of his 119-knot submarine which is propelled by compressed air.

How NAVY Flyers are

How does it feel to be a human projectile, hurled over the waves by a giant slingshot on the deck of a modern man o' war? Read what a Navy ace has to say of the thrills and dangers of launching a plane from a ship at sea.



A Vought Corsair observation plane on the turret catapult of a battleship. Above is shown the author, Lieut. Rhea S. Taylor, U. S. Navy, awaiting the takeoff. Note how his head is pressed against the rest.

POISED lightly on the rear end of a catapult aboard one of Uncle Sam's men o' war an observation plane awaits its "shot." The pilot examines his controls. He "revs up" the engine. All's well!

He extends his arm out from the cockpit. On deck the catapult crew watches his movements closely, for he's about ready to be shot into the air from one of the powerful catapults.

His arm remains extended while his left hand holds the throttle full open. The engine roars until it has been turning full speed several seconds. He withdraws his arm.

On deck one of the crew pulls the safety pin, another throws a lever. With an explosion much like that of a three-inch artillery gun the compressed air rushes from its tank and down the 60-foot runway the plane gathers momentum. Before the pilot can adjust himself to the suddenly-manufactured speed, he's in the air.

Always, when ready to be catapulted, I turn the engine at full speed until it's hot and ready to pull the observation plane on up and away from the ship. When I bring my arm back into the cockpit the crew on deck know I'm all set. Then I brace my head

Shot into the AIR

by LT. RHEA S. TAYLOR
U. S. Navy

A large Navy amphibian plane being catapulted from the turret catapult of the U. S. S. Tennessee.

firmly against the head rest, set the controls, hold the throttle open with one hand and the stick in the other and await the explosion. Suddenly the back of the seat pushes forward mightily, the plane moves from zero miles per hour to 60 in less than that

Above photo shows a seaplane being hoisted from the water and returned to the catapult.

This photograph, taken from the fighting top of the U. S. S. Wyoming, gives an excellent view of a seaplane being shot from the quarterdeck catapult while the ship is in motion. The catapult is rotated so that the plane always takes off into the wind. Escaping air may be seen at the center of the catapult.

many feet, and away I go.

My first experience in being shot from a catapult gave me the big thrill I had both expected and hoped would not happen. I took my place in the observation plane as a passenger for the first shot, preparing to go off again later in the day as a pilot. My pilot had warned me to brace my head firmly against the head rest, but had not mentioned the fact that there would be a slight delay between the signal to fire and the actual firing, and that one of the crew would pull the safety pin that prevents premature

This photo reveals the construction of the steel runway and truck. Note how truck fits pontoon step.

firing of the catapult and wave it before we went off.

I sat there a long time. It seemed nearly five minutes had passed, though probably not more than a few seconds had elapsed. Then I saw one of the crew come out waving something frantically. Thinking something had gone wrong and that the pilot failed to see it, I tried to reach forward and tap him on the head. While I was standing up, we went off!

By the time I had reeled in my neck and recovered consciousness we had landed. When we returned to the ship I asked what it was the enlisted man had been waving and was told. Never did I forget the important point that once on the catapult a pilot must keep his seat.

Later on the same day I climbed into the plane again, with a mechanic as passenger. As the ship lay at anchor, with scarcely any breeze blowing, we went off. This time I handled the controls. As soon as I gave the signal to fire I sat tight, almost frozen to the seat. We suddenly started moving with a rush and before I realized what was happening we were in the air and I was flying the plane as though we had taken off in normal flight from the water.

The first few times I was catapulted in the air before I knew what was happening. In fact, on the first flight I was 100 feet off before I realized we had taken off. However, the more a navy pilot experiences this form of being launched in a plane the more accustomed he becomes to the sudden propulsion. Soon he gains control of his faculties and learns to be in full command of himself before the plane leaves the carriage. My attitude has changed with experience.

Photo shows pilot giving signal that he is ready.

Of course, we have no control of the plane until it actually departs from the track and flies "on its own." I recall an experience when another pilot was to fly the plane while I was going off as passenger. At that time the ship had a new man on the catapult. The pilot leaned out to tap one of the exterior gasoline tanks and the man on deck misunderstood the signal.

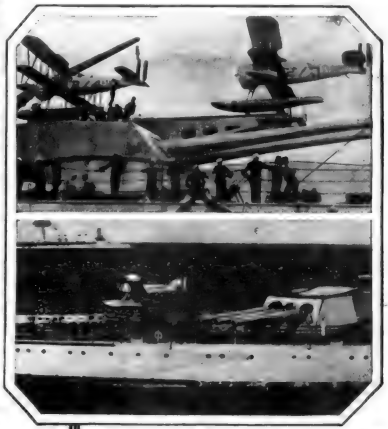
Meantime the pilot throttled the motor down, then turned it up, and put out his arm

in the orthodox manner to signal all was ready. I was watching the man at the catapult control, with my head far outside the cockpit. Suddenly he pulled the pin and another threw the starting handle. The pilot's arm was still extended.

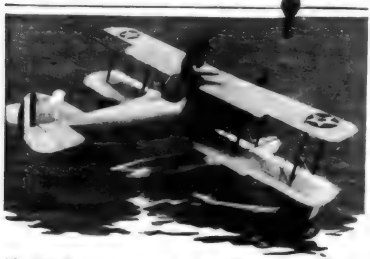
When I saw the second control operator turn the handle I tried to grab the stick. I managed to get the stick, all right, but only one foot reached the rudder. The catapult was fired before we were ready. We took off, did a right turn directly from the end of the catapult because my right foot was down on the rudder, and flew parallel to the moving ship. Those on deck did not realize we had gone off prematurely, but we made it safely.

Generally when two flyers are in one of the observation planes flown from battleship and cruiser catapults, one flies and the other safeguards the radio apparatus by holding it in place. Once I went off with a radio set in my lap. Not exactly pleasant, though not dangerous. I had a new pilot at the time and was trying to safeguard him by holding the throttle open with one hand and the radio set with the other.

Two types of catapults are used for launching navy planes—powder and compressed air. Each modern battleship carries two, one on the quarter deck and the other atop the highest after turret. Each also carries three seaplanes. These are kept in readiness on trucks that can be moved around the deck when necessary. Ordinarily a plane is kept on each catapult with the extra planes stowed on deck.



The quarterdeck of the U. S. S. Tennessee with an observation plane poised on the catapult. Top photo shows the U. S. S. Wyoming with two scout planes which are units of her equipment. One of them is kept constantly ready for flight.



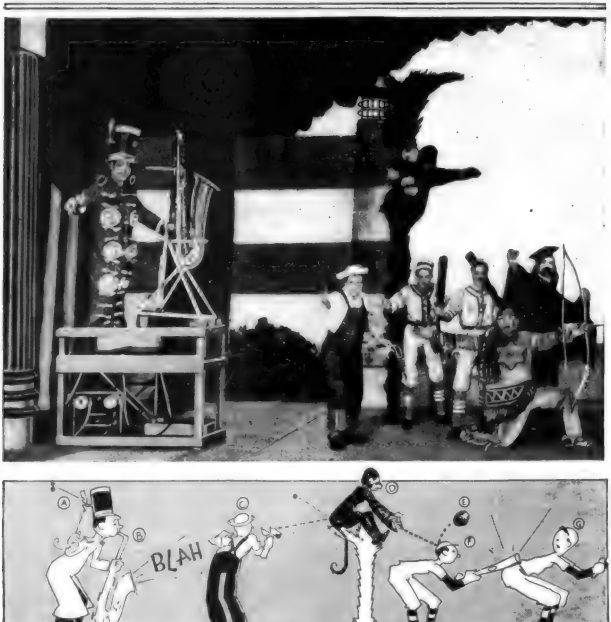
After the flight the seaplane lands on the water near the ship from where it is picked up and set down again on the catapult.

Catapults now in use consist of steel runway about 60 feet long and four feet wide, the truck on which the plane rests until it reaches the end of the runway, and the firing mechanism. Compressed air catapults fire a plane when air stored at 700 pounds pressure is suddenly released, while the powder-type catapult launches its planes with the approximate charge of a three-inch artillery shell, the charge being varied with the weight of the plane.

The catapults are pivoted near the center

(Continued on page 188)

Simple Things Complicated



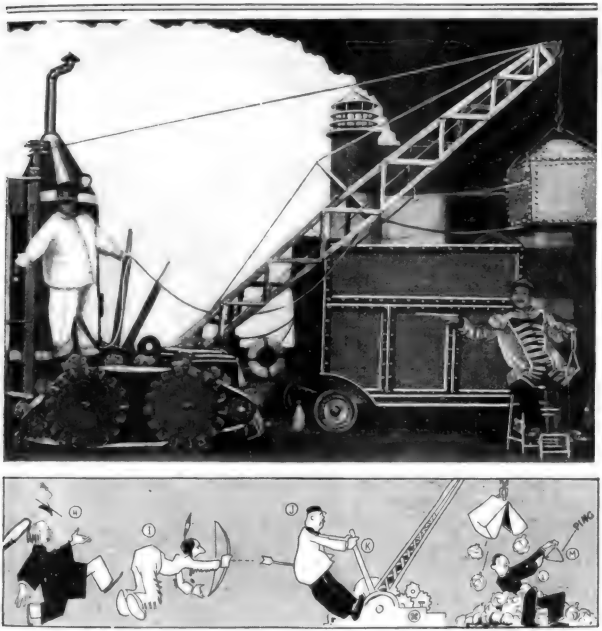
A simple device enabling a sleepy triangle tapper to accompany a saxophonist. The musician (B) judging his time to a nicety, toots whistle (A) at the proper moment. The farm lad (C) then shoots monkey (D) with his sling-shot. This enrages the monk, who drops cocoanut (E) on the head of Babe Ruth's

THE unemployment problem in this country would be quickly solved if all inventors would follow in the footsteps of Joe Cook, for that inimitable comedian of the stage and screen seems to have a perfect genius for complicating the simple things of life and employing nine men where but two were used before.

Take, for instance, the device pictured above, which is taken from a scene in "Fine and Dandy," a Joe Cook musical comedy which is enjoying a successful run on Broadway. The hilarious Joe, who seems capable of performing every stunt ever attempted on the stage, in this scene decides to play a saxophone and figures out that to obtain the proper effect he must be accompanied by a trap-drummer's triangle.

Now any ordinary saxophone player would be content to have the drummer in the orches-

in JOE COOK COMEDY



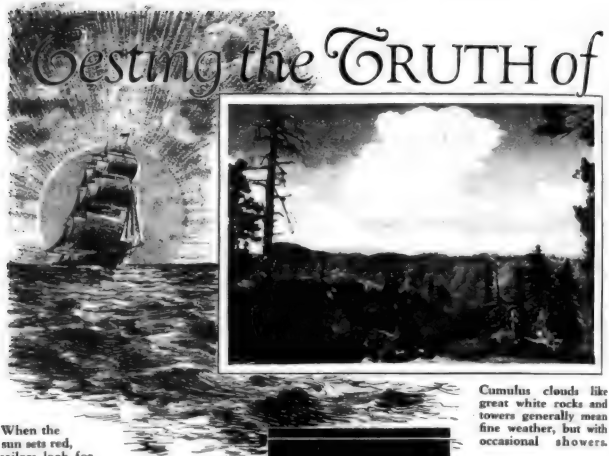
understudy (F). Ball player swats his partner (G) who does likewise to the professor (H). The professor, resenting this treatment, kicks Indian (I). The Indian shoots the stationary engineer (J) with an arrow, he in turn dumps cabbage (K) on sleeping musician (L) in time for him to wake up and tap triangle (M).

tra pit tap the triangle at the proper moment and let it go at that. But not Joe Cook. Joe searches high and low for the world's champion sleepy triangle tapper, and is then forced to go to the extreme pictured above to wake up the sleeping musician in time to get in the musical "pings" at the proper moment.

Another one of Cook's inventions in this comedy is the "Fruit and Flowers" idea. Joe is in the business of selling fruit and flowers, and business being somewhat slow, he figures out a way of boosting his trade. It's a boxing glove at the end of a spring which, when released, strikes the customer in the ribs, breaking two of them.

The customer then goes to the hospital and his friends send him fruit and flowers. All very simple, and it works—on the stage. Of course, if the fruit and flowers are bought elsewhere. Cook loses.

Testing the TRUTH of



When the sun sets red, sailors look forward to fair weather the next day. "Red sun at night, sailors delight; red sun at morning, sailors take warning."

Cumulus clouds like great white rocks and towers generally mean fine weather, but with occasional showers.

by CALVIN FRAZER

How much truth is there in the old proverbs that cite various signs of Nature as prophetic of tomorrow's weather? In this article, Mr. Frazer puts these signs to the test of science.

Unscientific weather prophets believe that when the "old moon appears in the new moon's arms," there is a severe storm in the offing.

THE sage old farmer, who depends a lot on the weather for the success of his crops, squints up at the clouds and opines, "Mackerel sky, not twenty-four hours dry." The old sea dog, who must lay his course and set his sails according to the caprices of the weather, surveys the sky and says, "Red sun at night, sailor's delight; red sun at morning, sailors take warning," or, "When the wind backs against the sun, dirty weather is sure to come." The cowboy counts the stars in the ring around the moon and believes that rain will fall before as many days have elapsed as there are stars in the halo.

Such signs are the means by which homely prophets, remembering traditional proverbs, predict the weather for the coming period. Whatever their content of truth or error, one good thing can be said about these time-honored proverbs concerning nature's weather signs—they are easy to remember, and hence, so far as they embody useful information, they are of service in enabling people to keep such information in mind.

Dr. W. J. Humphreys, of the United States Weather Bureau, who has probably devoted more attention than any other meteorologist to the task of separating the sheep from the goats among these time-honored maxims, was so much impressed with the utility of the proverbial form as an aid to memory that he has made a collection of these proverbs for

Nature's Weather Signs

According to an old nautical proverb, when "the sun is getting up his back-stays, it is time to look out for bad weather." Thus, when the sun is drawing water, as shown above, nasty weather is near.

Although the ring around the moon does bear some relation to weather changes, it is not true that the stars in the halo indicate the number of days till bad weather.

the purpose of scientific examination. The most widely known of these are the following ones, which are excellent, though not infallible:

"Evening red and the morning gray,
Sends the traveller on his way:
Evening gray and the morning red,
Brings down showers upon his head."

"A rainbow in the morning is the shepherd's warning:
A rainbow at night is the shepherd's delight."

"When the wind's in the South, the rain's in its mouth."

"The higher the clouds, the finer the weather."

"Mare's tails and mackerel scales, make tall ships carry low sails."

The scientifically unsound belief that winter will be thick or thin according to the thickness of the goose's breastbone comes down to us from the ancient superstitious Assyrians.

"When the clouds appear like rocks and towers.
The earth's refreshed by frequent showers."

Unfortunately, at least three-fourths of the weather proverbs now current are sheer nonsense. Many of these delusive sayings owe their origin to the once universal belief that "coming events cast their shadows before them" and that nature supplies innumerable omens of whatever, in the near or distant future, will affect the welfare of mankind. These omens were not, as a rule, supposed to have any physical connection with the events they foreshadowed. Thus a comet was believed to portend the death of a king, but not to have any hand in killing him, and the configuration of the planets at a person's birth was thought to foretell the events of his life but not actually to control them

Rainbows play an important part in unscientific weather forecasting. Rainbows appearing in the morning are supposed to bring bad weather; at night, fair weather.

Cold, nasty, windy weather is due in a short time when clouds have a jagged, lowering aspect as shown in photo.

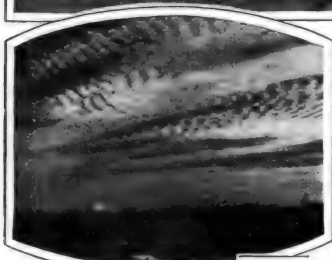
Most proverbs that involve long-range predictions of weather hark back to this belief in signs and portents, and do not depend upon any meteorological theory, however crude. Among these there are many relating to so-called "key days," the weather of which was supposed to furnish a clue to the weather of subsequent more or less distant periods. Thus each of the twelve days beginning with Christmas was thought to indicate the weather of one of the twelve succeeding months. There are several old sayings like the following:

"Where the wind is on Martinmas Eve, there it will be for the rest of the winter."

"Easter in snow, Christmas in mud; Christmas in snow, Easter in mud."

"St. Stephens Day windy, bad for next year's grapes."

A famous tradition of this class asserts that sunshine on Candlemas Day (February 2) means that cold weather will last another six weeks, while cloudy weather on that day signifies that the winter is over. Originally no animal of any sort was concerned in this superstition, but eventually the idea arose that a hibernating animal comes out of his winter home on Candlemas Day, and either goes back again or remains in the open, according to whether he sees or does not see his shadow. In Europe this creature was said to be a bear or a badger, but in America the



Farmers, who live close to nature, give considerable attention to weather signs. They believe that the thickness of the corn husks indicates the severity of the coming winter.

According to an old proverb, when the clouds appear like "mares tails and mackerel scales," there is supposed to be a period of windy weather ahead.

prophetic role has been transferred to the groundhog. The most ridiculous feature of the Groundhog Day superstition is the assumption that groundhogs all over the country choose this particular date for emerging from their burrows after their winter sleep!

Equally familiar is the tradition about St. Swithin's Day (July 15):

"St. Swithin's Day, if ye do rain, for forty days it will remain;
St. Swithin's Day, an ye be fair, for forty days 'twill rain nae mair."

There is not the slightest scientific justification for any of these notions about key days, and the same may be said of the beliefs concerning another class of weather omens, illustrated by the old rule of the goosebone: "If the November goosebone be thick, so will the winter weather be; if the November goosebone be thin, so will the winter weather be."

This notion comes to us from Germany, but is probably now more familiar in the United States than in the country where it originated. The bone in question is the breastbone of a goose, and the custom of examining it in order to learn the character of the subsequent winter is quite on a par with that of the old Assyrian soothsayers, who were wont to inspect the liver of a sacrificial animal for tokens of the coming political events of their country.

(Continued on page 182)

Engineers Make Record of Street Noises to Abate Din

Noises of Chicago streets were photographed with the sound recording device shown above. Insert shows a record of the sound produced on film.

THE din created by street cars, elevateds and the host of other vehicles that pass along the streets of a modern crowded city is coming to be looked upon by engineers as not only an affliction visited upon the eardrums but, what is more important, as a waste of mechanical energy.

With this in mind, acoustical engineers from the United States Steel Corporation are gathering data for the Noise Abatement Commission of Chicago with an instrument which photographs the noise and records it on a film, as shown in the photo at the left. The recorder works on the same principle as the sound recorders used in movie studios. The noise acts upon a light sensitive tube, which creates the record on the film.

Artificial Silk Made From Air

PROF. Harold Hibbert, of McGill University, Montreal, has completed successful experiments whereby he is able to spin out artificial silk from the atmosphere. The constitutents in the air with which he dealt were water and carbon dioxide. With this new method, artificial silk, cotton and paper can be manufactured without the use of the cotton plant or the spruce tree.

"It has long been known," explains Prof. Hibbert, "that the plant forms sugar from the carbon dioxide and water in the atmosphere. The most difficult step of our experiment was in finding a method of converting the sugar and other natural plant products into the cellulose which is the principal ingredient of wood and paper, and the substance from which artificial silk is made. After years of experimenting, this step was brought about by adding a common bacterium to the sugar.

"Furthermore this discovery also means that it is now possible to take ordinary cane and other sugars and convert them into cellulose and make artificial silk, cotton and wood. The discovery of this process has been the subject of exhaustive study and research on my part for years."

The industrial and commercial possibilities which are latent in these scientific findings remain immeasurable, Prof. Hibbert believes.

Heater Melts Ice Off Windshield

Ice and sleet on the windshield are melted by means of this heater which is hooked to the battery.

A DEVICE for keeping the sleet and ice off windshields by heating the glass so that frozen particles cannot collect has recently been placed on the market. The device, shown in the photo above, consists of an aluminum frame containing an electrical heating element, the current for which is supplied by the storage battery. The amount of heat applied is regulated by a rheostat.

$100 for Photos of Your Plane

Here's a nifty home-made parasol type monoplane built by a young chap over in England.

Why not make that light plane of yours pay dividends from the start? Here's a chance to help finance the motor for it.

THIS is Andy, the grease monkey, speaking.

In the past two issues of Double M the editors up at the main shebang have been going through the throes of announcing our big new light plane contest. Now I'm goin' to give you the real low down on my pet idea.

Most of my fan mail—and believe me, I have plenty—is either a request for dope on building light planes or else a camera study of the completed job, mostly from our plans but occasionally from home-made designs, and sometimes from no design at all.

Being way off in a corner, so to speak, and never hearing anything about the outside world except what my mail reveals, I have formed the idea that everybody and his brother is building some kind of a crate. Now, if everybody is doing this there must be some one who is doing it just a little bit better. I want to find out who this champ is and have kindly permitted the big boss to put up the money to find out.

All you have to do to try for the champeenship is to take a few photos of that crate of yours, write out a few specification figgers, and mail 'em in to us. If you think they are needed, you can make some sketches of the points the camera don't show; and it might be a good idea to take some shots of the job under construction.

Three lightplane builders constructing a wing.

Rules of the Contest

For photographs and brief description of the construction of the home-built light plane, which in the opinion of the judges shows the best workmanship and greatest ingenuity, MODERN MECHANICS AND INVENTIONS will award a prize of $100.00. For the second and third best light planes prizes of $50.00 and $25.00 respectively will be awarded. MODERN MECHANICS AND INVENTIONS reserves the right to buy any other photographs submitted at our regular rates. No photographs will be returned unless such a request is accompanied by a stamped, addressed envelope, and enclosed with the submitted photographs. In case of ties, duplicate prizes will be awarded.

Anyone may compete who is a resident of the United States or Canada except members of the staff of this magazine, or their families, and holders of a Department of Commerce license above the grade of private pilot.

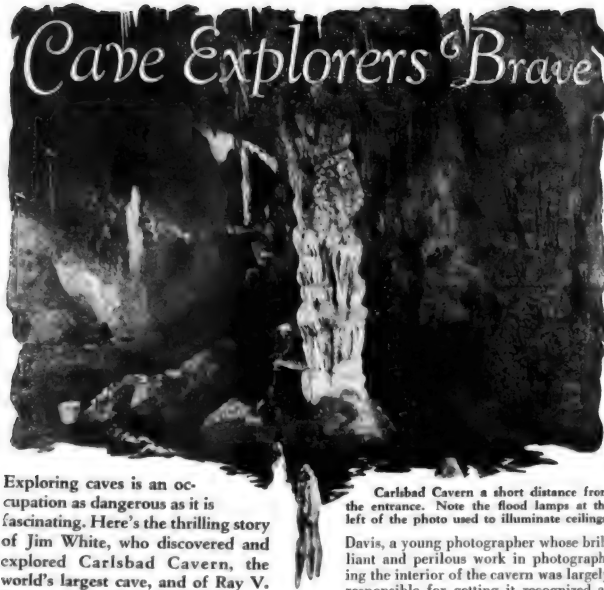
It is not necessary to buy a copy of the magazine or to be a yearly subscriber.

All photographs and descriptions should be submitted in the same envelope. Each photograph should have the sender's name and address written on the reverse side.

All entries must reach this office on or before March 1, 1931. They should be addressed to

Light Plane Editor
Modern Mechanics and Inventions
529 Seventh Street So., Minneapolis, Minn.

Cave Explorers Brave



Carlsbad Cavern a short distance from the entrance. Note the flood lamps at the left of the photo used to illuminate ceilings.

Exploring caves is an occupation as dangerous as it is fascinating. Here's the thrilling story of Jim White, who discovered and explored Carlsbad Cavern, the world's largest cave, and of Ray V. Davis, who risked his life to photograph the interior.

NEWS that a 750-foot elevator is soon to be installed for the convenience of visitors to Carlsbad Cavern, New Mexico—the largest cave in the world yet discovered — focuses attention on this most remarkable of natural wonders which, unknown a few years ago, is rapidly gaining a deserved place in the public mind as one of the nation's most spectacular scenic marvels.

The cave itself was discovered by Jim White some 30 years ago, but honors for its discovery must be shared with Ray V. Davis, a young photographer whose brilliant and perilous work in photographing the interior of the cavern was largely responsible for getting it recognized as a national monument. Both of these men have flirted with death scores of times in their wanderings through unknown passages, uncertain of what lay before them or of what might happen the next minute.

Fountain of the Fairies. Water, dripping through mineralized soils, built up these beautiful formations through countless ages.

After his initial trip in 1901, when he spent three days and nights, laboriously covering the seven miles the tourist now makes in less than a day, Jim White did not again enter the cavern until 1906. At this time he explored the Lower Chamber, 900 feet below the surface of the earth. He got into this room by way of the Jumping Off Place which is one of the most fearsome precipices yet found in the cavern.

Unknown Perils

By ANNIE DYER NUNN

Ray V. Davis, photographer of Carlsbad Cavern, entering the cave. Owing to the size of the cave, he had to develop special lamps and methods to obtain successful pictures.

Now, the Jumping Off Place is beautifully lighted and so is the Lower Chamber which is visible from the Big Room; but when White was lowered over the precipice, nothing could be seen there save a huge rock shelf jutting into illimitable black void. Holding his kerosene torch, a futile speck of light in utter darkness, and whirling first one way and then another at the end of a rope, he slowly descended through unknown depths into a room large enough to hold a building a block square and 15 stories high.

That same year, White took charge of a big guano industry that was operating at the east end of the cavern where a mountain of bat fertilizer, 500 yards long and 150 feet deep,

Jim White, discoverer and explorer of Carlsbad Cavern. The photo shows him standing in the doorway of a shack through which buckets filled with guano were hauled up from the cave depths.

the accumulations of centuries, was being leveled. During the fifteen years that White was with this company, 100,000 tons of guano are said to have been moved out of the cavern. The guano was brought up by means of an iron bucket windlassed through an artificial shaft, 170 feet deep.

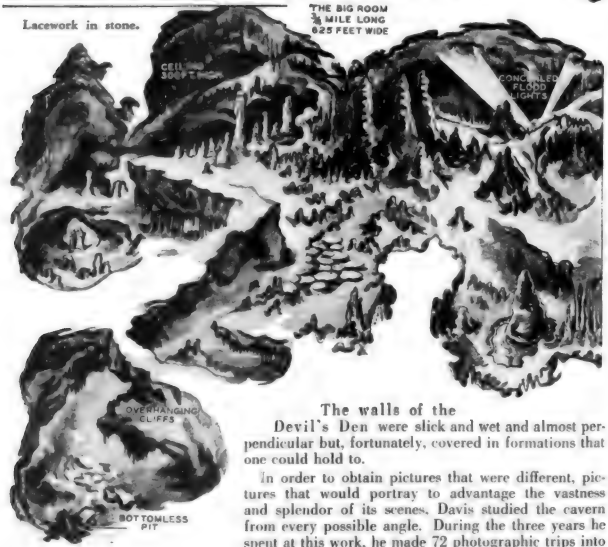
It was by means of this bucket that tourist travel through Carlsbad Cavern began—Mr. White inveigled a few trusting souls into taking the perilous trip with him. Some of them were prominent people through whose influence he hoped to bring recognition to the cavern

Lacework in stone.

which, he felt, must surely be one of the wonders of America.

It was in 1921 that White persuaded Ray Davis, a young photographer living at Carlsbad, N. M., 27 miles from the cavern, to begin the work of photographing it. When Davis saw the great possibilities of the undertaking, he went at it with the same exhaustless enthusiasm that characterized White's exploring. To the fine team work of these two men, the nation owes the opening of one of our most important national monuments—Carlsbad Cavern.

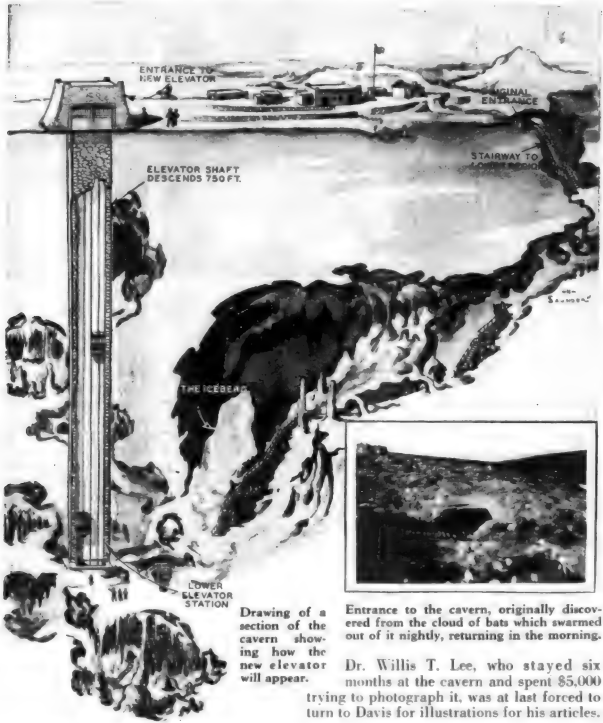
If Davis could have left his equipment in the cavern, his work would have been far easier, but owing to the dampness underground, his 75-pound load always had to be carried in and out, over a wearisome, treacherous trail. There was a 300-foot hole—the Devil's Den—in the mile-long corridor which led to the most spectacular part of the trip, that had to be crossed.



The walls of the Devil's Den were slick and wet and almost perpendicular but, fortunately, covered in formations that one could hold to.

In order to obtain pictures that were different, pictures that would portray to advantage the vastness and splendor of its scenes, Davis studied the cavern from every possible angle. During the three years he spent at this work, he made 72 photographic trips into the cavern, each lasting from 12 to 15 hours. Some idea

New Cavern Elevator Will Make Ascent From Cave Easier for Visitors



Drawing of a section of the cavern showing how the new elevator will appear.

Entrance to the cavern, originally discovered from the cloud of bats which swarmed out of it nightly, returning in the morning.

of the difficulty he had in obtaining good pictures is gathered from the fact that out of more than a thousand exposures, he got but 75 creditable views. The photographs of cavern interiors shown with this article are the work of Mr. Davis.

Other photographers tried their luck in the cavern, but none of them produced pictures that could approach the perfection of Davis' work, that is, without his assistance. Even Dr. Willis T. Lee, who stayed six months at the cavern and spent $5,000 trying to photograph it, was at last forced to turn to Davis for illustrations for his articles.

After months of expensive experiment, Davis found that, owing to the immensity of the cavern rooms, flash lights and ordinary blow lamps were not powerful enough for proper lighting. They did not give the perpective he desired for huge formations and towering walls. This led to his inventing and manufacturing a large blow lamp which could illuminate a radius of several hundred feet. It was expensive to operate, requiring $15 worth of magnesium powder for each

Jim White is shown above in a new room discovered seven miles from the entrance. Only a few people have seen it. At right above are the giant stalagmites in the Big Room, whose size may be guessed by comparing with the figure of the man.

scene, and was mean to handle: once it exploded and Davis was severely burned.

Adventure has gone into the making of Davis' cavern pictures: One day, he was lost in a remote part of the cavern with slight hope of finding his way to familiar ground, and only came through safely by mere chance. At another time, a sliding stone filled up a tunnel he had just come through, closing him up in a room in which he searched for hours before he found an exit. Twice he was nearly killed by falling.

He had one of these falls when he was preparing to shoot the Twin Domes, stalagmites that reach to a height of 100 feet. They are located in the Big Room which is nearly a mile long, from 400 to 600 feet wide and 300 feet high. In order to get a good view of the Domes, Davis had to climb a projection on the wall opposite them to a height of 75 feet. Below, the flowstone floor bristled with jagged formations. To fall on them could mean only death, so it was with the utmost caution that he crept up the slippery way. He had his camera and tripod strapped to his back. Finally he reached the top of the projection, a narrow, flat surface. He had set up his tripod and was adjusting the camera when he stumbled and fell. As he went over the precipice, he grabbed out wildly and caught a leg of the tripod. The tripod landed on a formation and, by some miracle, held there until he could pull himself back up.

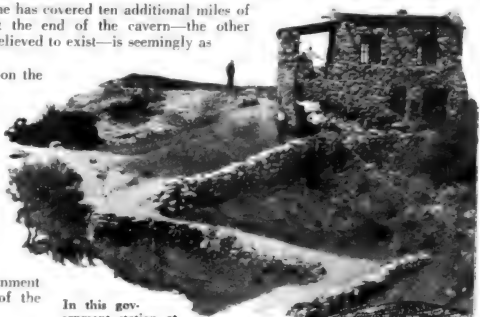
By the latter part of 1922, Davis was selling his cavern pictures to the foremost newspapers. Through them the New Mexico Land Commission became interested in the cavern and recommended it to government notice. In consequence, Washington sent an engineer to the cavern to see if it were large enough for a national monument. He was easily convinced. After a day of bumping and sliding and catapulting about with Jim White, the engineer said: "It's big enough, all right. Now, how do we get out?"

In 1923-24, three surveys were made of the cavern: by the U. S. General Land Office; by the U. S. Geological Survey, with Dr. Lee in charge; by the National Geographic Society, Dr. Lee again officiating. Under White's guidance, 21 miles in all were sur-

In exploring the cave, Jim White carried a lariat with which he hauled himself up over jagged walls by draping it around projections many feet above him. The slightest slip would have sent him plunging to his death.

veyed. Since then, he has covered ten additional miles of new territory. But the end of the cavern—the other entrance which is believed to exist—is seemingly as remote as ever.

Dr. Lee's report on the cavern resulted in its being declared a national monument, in October, 1923. The president of the Chamber of Commerce was appointed civilian custodian. In April, 1926, the present custodian, Thomas Boles on government pay, took charge of the cavern.



In this government station at the cavern entrance tickets are sold to the many Carlsbad visitors.

By July, 1924, a sizable number of visitors were arriving at the cavern, thanks to Davis' pictures, and trails had to be built for them. Jim White took charge of the work and proved himself almost as good an engineer as he was an explorer. A government engineer was sent to the cavern to relieve White of this work; but after a few weeks of futile effort to make the way safe for tourists, the engineer admitted that underground trail building was not in his line. He was accustomed to blasting, he said, and since this would not be permitted in the cavern, he was at a total loss; so he retired, leaving the field to White who accomplished a remarkable piece of work.

Gradually, telephones and electric lights were installed in the cavern. The first electric cable extended from the entrance down through the corridor to the Big Room which is 720 feet below the earth's surface. The fixtures were placed on the ground, lamps that sent their light upward—owing to the enormous height of the ceiling, it would have been impossible to install them there. To meet the need for a powerful illumination of the Big Room, in which the lantern light was so inadequate, Davis introduced a 50,000 candle power magnesium flare with which he would run for a distance of several hundred yards. It was weirdly artistic and, for a brief time, splendidly revealed the unimaginable glories of ceiling and floor.

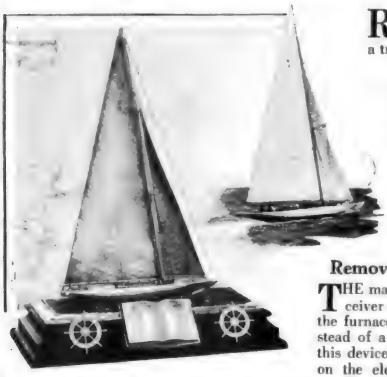
In the cavern now there are 400 flood lights, some of them 2,000 candle power. The lamps, which reflect their light from the dusky-white formations above, are concealed from view. The cavern is filled with a soft radiance without a glare of any kind.

The latest improvement is the elevator mentioned above.

Cont'd on page 184

On one occasion Photographer Davis, slipping from a 75-foot ledge, saved himself from death by grasping the leg of his camera tripod, which held solidly.

Silversmith Makes Perfect Silver Model of Sailing Yacht



Wrought from silver, this model yacht is perfect in detail, as photos illustrate.

RECENTLY a Los Angeles silversmith was called upon to make a trophy which would be more than a mere ornament; it was to be a perfect model of a sailing yacht done in sterling silver.

How well the order was filled is shown in the photos at the left. Comparison of the model with the yacht will show how closely they coincide. The blocks and pulleys and all fittings were machined from pure silver to a perfect scale.

Science Needs Non-Melting Furnace

THE time-honored joke about the chemist who discovered the universal solvent but could find nothing to keep it in is about to be matched in actual fact, and to the threatened misfortune of metallurgy, an eminent metallurgist explained in a recent lecture, by the difficulty of obtaining any crucible material which will not melt under the very high temperatures developed in modern methods of making and handling metals.

High temperatures frequently are absolutely necessary in making some of the most useful modern metals, like the alloys of iron and chromium with smaller amounts of other metals used in forming the various kinds of "stainless steel." High temperatures might be used, too, to cheapen the production of many metals, even of iron itself.

In the way of all such developments, however, stands the fact that when the metal is heated to these very high temperatures, the crucible containing it melts, the lining of the furnace melts and runs away, and the apparatus is destroyed. One of the greatest needs of technology is thus the invention of new types of heat-resisting material out of which furnaces can be constructed for high-temperature metallurgy.

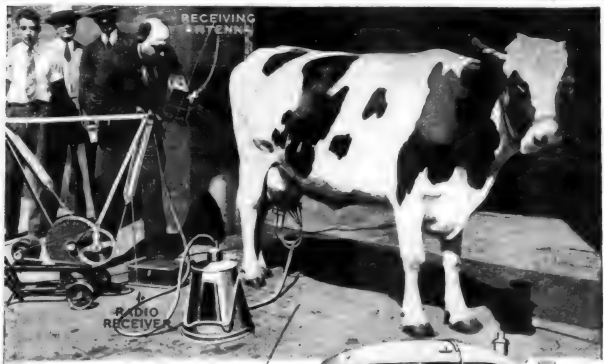
Removing Ashes Now Easy Job

THE manufacturers of the Uplifter ash receiver claim that removing ashes from the furnace may now become a pleasure instead of a menial task and nuisance. With this device you merely place the empty can on the elevator, give a few turns on the handle, and the can is in place to receive the ashes when the grate is shaken. To empty you merely reverse the process.

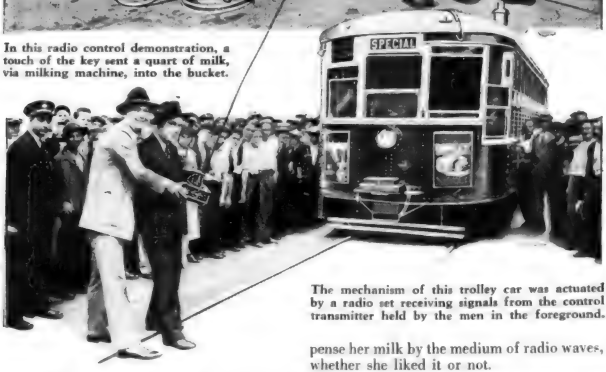
The Uplifter may be placed under any type or make of heater. It is installed in a special dustless pit under the heater and does not interfere with the draft

Showing how pit and elevator solve ash problem.

Radio Milks Cows, Runs Street Cars



In this radio control demonstration, a touch of the key sent a quart of milk, via milking machine, into the bucket.



The mechanism of this trolley car was actuated by a radio set receiving signals from the control transmitter held by the men in the foreground.

THERE seems to be no end to the versatility of radio in these days of electrical and mechanical miracles—not even cows and street cars are immune to the influences of its radiations. As a curtain raiser at the annual radio show held recently in St. Louis, a street car was operated from a distance by a mere man with a radio transmitter in his hand, and a Holstein cow was made to dispense her milk by the medium of radio waves, whether she liked it or not.

The mechanism of the trolley car and the mechanism of the milking machine were hooked up to a specially constructed radio receiver using only a five-foot length of copper pipe as an antenna. At a distance stood the operator, holding a portable radio transmitter using a similar antenna, as shown in the accompanying photos. When the key was pressed at the transmitter, the distant receiver in both cases set the machines to operating.

Walking on Water Is Simple Feat With Small Balloon

Here is Herbert McFall starting to walk across the lagoons at Venice, Cal. The balloon supports most of his weight so that touching the water with his foot kicks him aloft. Weights are carefully balanced.

USING a balloon delicately adjusted so that his weight was practically counterbalanced, Herbert McFall recently gave a demonstration of his ability to walk on water in the lagoons at Venice, California. Effect of the balloon is to counteract the pull of gravity for its pilot so that he can leap scores of feet into the air with the greatest ease, in much the same fashion that a man on the moon could jump forty or fifty feet without effort. In inflating such balloons, care must be taken to make sure that the pilot's weight will be slightly greater than the lifting capacity, otherwise when he leaped into the air he wouldn't come down unless he released some of the hydrogen gas.

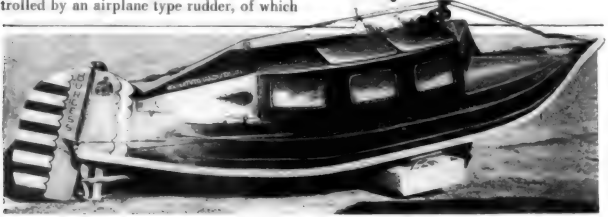
Automatic Calendar on Clock

A NEW electric clock has recently been perfected which, in addition to telling the time of day, also keeps track of the day of the week and month. On the stroke of midnight the dates at the bottom of the clock change.

Note calendar at bottom

21-Foot Motor Boat Resembling Pontoon Starts Long Pacific Journey

A LONE trip from Santa Monica, Cal., to Honolulu in a novel boat built to resemble the pontoon of a well-known seaplane is the adventurous project of William Burgess, shown below with his unique craft. The boat is built of airplane plywood, and is controlled by an airplane type rudder, of which two-thirds of its area is above water. When Burgess is sleeping the craft will proceed under robot control. Forty m.p.h. is the estimated top speed of the *Miss Ionia*, as it is named.



Employing features of airplane pontoon design, this striking motor boat is soon to start for Honolulu.

PLANE TALK

Edited by
MAJOR H. H. ARNOLD

Major Arnold, who conducts this monthly department, discusses aviation from a background of more than twenty years' experience. This month he takes up some of the most recent developments in the conquest of the air and describes the methods used in marking the aerial highways.

A New Patent High Speed Gun Mounting For Aircraft

THIS gun mounting has been designed to fulfill the latest operational requirements of military and naval aircraft and to overcome the extreme difficulties experienced with the ring type mounting when used at maximum speeds on high-performance aircraft. A greater firing area than has hitherto been obtainable is secured by the new gun mounting, now making it possible to fire directly astern or vertically upwards and downwards, as well as over the usual areas, including that forward and above the upper wings. Having few moving parts and being definitely locked in position, the new gun mounting enables the gunner to hold a much steadier aim.

The employment of the new gun mounting allows a saving of approximately fifteen pounds in weight, and being more compact, the space in the gunner's cockpit is not restricted to the same extent as has previously been the case.

This saving is additionally increased, for, when not in use, the gun and mounting are locked in a concealed position within the top fuselage fairing astern of the gunner's cockpit, which is thus left entirely clear of obstruction by these fittings.

To conclude it might be mentioned that much is gained in the way of overcoming parasite air-resistance by the more symmetrical shape and design of the gun mounting, and the concealment of the gun.

Above is shown a Lewis gun mounted on the new type of mount which may soon replace the old scarf mounting. In this photo the gun is firing over the wing. At the left is shown the gun in position for firing down.

Many Types of Markers to Aid Day and Night Flying

The various types of air markers and beacons mentioned by Major Arnold are shown in this drawing.

EVERY day that passes sees additional landmarks identified to guide the passing aviator. At night the most important of our airways are marked every 5 to 25 miles with beacons. These beacons have distinctive beams and are so placed that regardless of the character of the terrain flown over, the airman has always at least one light in sight.

Beacons are usually painted brilliant colors and are lettered and numbered for identification. Towns and cities are usually identified with their names painted in large letters on buildings. Airdromes have their names in huge letters where they may readily be seen, and recently work has been started toward painting the names of the most important automobile routes along highways as shown above. Buildings along airways also have their roofs painted in distinctive color schemes to aid daylight flying.

Here's the First Photo Ever Taken From a Plane in Flight

The harbor and city of San Diego, California, taken from the air with a bellows camera Jan. 10, 1911.

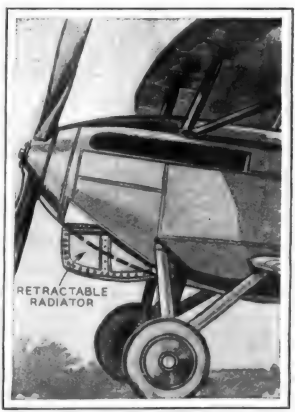
SITTING on a frail cane-bottomed seat, his feet crossed underneath, while flying at 30 miles an hour in a wobbling airplane whose safety few trusted, Maj. H. A. Erickson 20 years ago made what is believed to be the first photograph ever taken from an airplane in flight. Major Erickson found the picture recently among his keepsakes.

With Charles K. Hamilton, then a famous pilot, Major Erickson took off from what is now a fairway on the Coronado Golf club and for 20 minutes flew at an altitude of 500 feet over San Diego bay and the nearby Pacific Ocean. With a German bellows camera, Erickson shot the now famous picture. It revealed a portion of the San Diego waterfront. During the war the original negative, which measured 3¼ by 4¼ inches, was stolen. The only print remaining was lost 12 years until Erickson found it recently.

Where today flying photographers "work" in enclosed planes that fly 150 miles an hour, Erickson made the first picture while sitting in the 30-mile-an-hour wind blast, directly in front of the pusher-type propeller.

Retractable Radiator Adds Speed

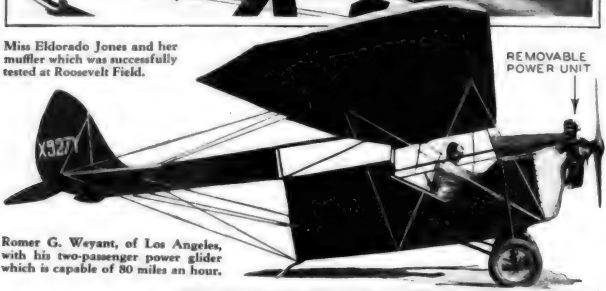
ONE of the most interesting construction details on any of the airplanes at the Chicago races was that on one of the foreign entries—a retractable radiator. As shown at the right, the radiator, when retracted, makes a perfect stream line for the bottom of the fuselage and aids materially in increasing the speed. However, when the weather is hot or when the engine turns at full throttle the radiator is lowered to obtain the maximum cooling effect. The advantages of such a radiator on military and transport planes are obvious.



The retractable radiator is here shown lowered. The dotted lines show its position when retracted.

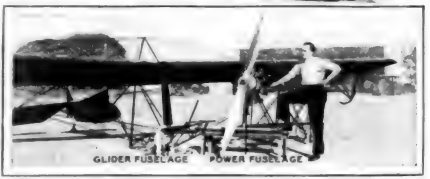
Some of the Recent Developments in the Aircraft Industry

Miss Eldorado Jones and her muffler which was successfully tested at Roosevelt Field.



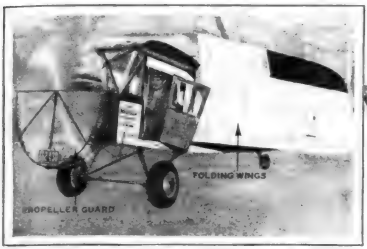
Romer G. Weyant, of Los Angeles, with his two-passenger power glider which is capable of 80 miles an hour.

THE roar of the exhaust of ever more powerful airplane engines has been increasing steadily until it has almost passed beyond the nuisance stage with those who are brought into close touch with aircraft, while to military and naval aviation it is a serious limitation on operations, as it proves an absolute barrier to surprise maneuvers. Therefore the invention of Miss Eldorado Jones, the first successful exhaust muffler for airplane engines, has been welcomed with open arms by the aviation industry. Her device, which resembles in appearance an ordinary Ford muffler, consists of a series of small pinwheels which "chew up" the sound waves and retard the passage of exhaust gases without creating undue back pressure upon the engine.



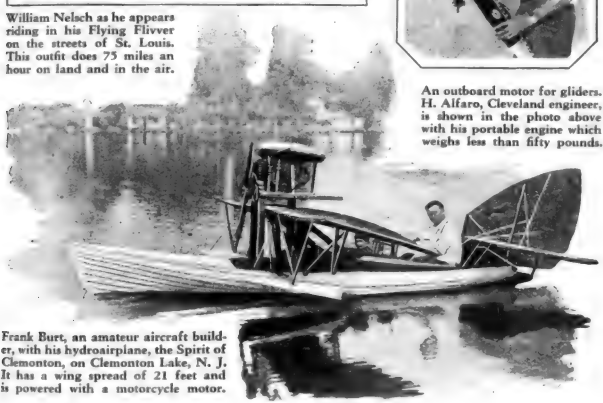
Here is the "Double Duty" outfit with which A. B. Green, of Los Angeles, Calif., hopes to turn out accomplished pilots in four hours.

Flying Flivvers Receive the Attention of Many Designers



William Nelsch as he appears riding in his Flying Flivver on the streets of St. Louis. This outfit does 75 miles an hour on land and in the air.

An outboard motor for gliders. H. Alfaro, Cleveland engineer, is shown in the photo above with his portable engine which weighs less than fifty pounds.



Frank Burt, an amateur aircraft builder, with his hydroairplane, the Spirit of Clemonton, on Clemonton Lake, N. J. It has a wing spread of 21 feet and is powered with a motorcycle motor.

The "Flying Bathtub" is a glider with a detachable power plant which may be installed or removed in twenty minutes. In tests with a 40 h.p. Salmson motor the ship took off in 20 feet and climbed to 22,000 feet in twenty minutes. It has a top speed of nearly 100 miles an hour and uses less than three gallons of gas an hour. Large scale production is planned for this ship which will sell for less than $1,000.

Another step in the same direction is the interchangeable fuselage of the glider designed by A. B. Green, of Los Angeles. In this job the lifting surfaces may be changed from the glider fuselage to the powered fuselage in a very few minutes.

William Nelsch, of St. Louis, has invented a real "Flying Flivver" which may be driven about the streets the same as an auto. It has an air and ground speed of 75 miles an hour. The wings may be folded up while the propeller is encased in a protection screening for safety on the ground.

H. Alfaro, a Cleveland engineer, has perfected a glider motor weighing less than fifty pounds which develops 27 h.p. The flying rowboat, designed by Frank Burt, of Clemonton, N. J., failed to rise from the water with its motorcycle engine, although it did 35 miles per hour on the surface.

The Great Wall of China

An artist's conception of how the great wall of China will appear when converted into an elevated boulevard extending fifteen hundred miles westward from the city of Peking.

The plans of the Nationalist Government of the Republic of China for converting the great wall into a major motor highway are revealed to the world for the first time in this exclusive story.

Vehicles like this will be scarce along the Great Wall Highway. It would take this cart about 50 days of continuous travel to cover its full length.

THE Great Wall of China, long considered one of the most remarkable engineering feats in the world, may soon become one of the greatest and most unusual motor highways on earth if the plans of the Nationalist government are carried through.

The great wall was built about 220 B. C. by the first emperor of the Tsin Dynasty as a protection against the roving bands of Tartars, which were then in the habit of descending from the Mongolian plains and making sporadic raids upon the Chinese cities to the south. After 2150 years the wall is still in a remarkable state of preservation considering that only twice, in the fifteenth and again in the sixteenth century, were any extensive repairs made upon the structure.

The height of the wall ranges from twenty to forty feet, while at intervals of about two hundred yards are towers about 25 feet higher than the wall. The northern parapet of the entire fortification is loop-holed to protect the defenders from the missiles of the enemy, while the towers are surmounted by such a parapet around all four sides. Many of the towers are roofed over, and were no doubt used as barracks by the Chinese soldiers, while sentries were posted at the other towers.

to be Motor Highway

The wall is from fifteen to thirty feet wide at the base, and tapers inward to an average width of about twelve feet on top. Two solid masonry parallel walls from eighteen inches to four feet in thickness were first built, and the space between was then filled with loose stone and earth. Owing to lack of care, these outside walls have crumbled in places, but not to such an extent that their repair would be exorbitant.

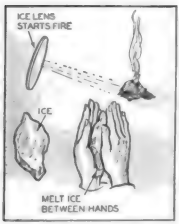
Imagine, if you can, such a wall stretched across the United States. Starting at Washington, D. C., it would extend north to Cincinnati, then south around Cairo, Ill.; north again to Marshall, Missouri, south of Wichita, Kansas, and west to about fifty miles from Denver, Colorado—a serpentine path more than 1,500 miles in length.

With a smooth motor road laid on top of the wall its value to China would be enormous; for besides its unquestioned military value, enabling the government to stamp out the incessant banditry in the interior provinces, it would do much toward helping the rehabilitation of those who are isolated in this mysterious interior country, and who sometimes starve to death because food, plentiful on the coast, cannot be transported inland in time

A typical section of the Great Wall showing how its winding course follows the high ground. Above is a map of the United States superimposed upon that of China to show the relative size of the wall.

HANDIKINKS

In performing the simple tasks of your daily life you can often save considerable time and effort by carrying out the ideas presented in this department of Modern Mechanics every month.

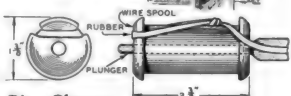


You Can Set Paper Afire With a Piece of Ice

BELIEVE it or not, but you can actually start a fire with a piece of ice. And this is accomplished, strange as it may seem, by first converting the ice into a burning glass, better known as a magnifying glass. To form the lens, hold the small piece of ice between the palms of the hands, as illustrated in the drawing at the left, and allow it to melt until it has taken the shape of a magnifying glass—thick in the center and rounding off to thin edges. Now procure a piece of paper or some tinder and focus the sun's rays on it with the ice burning glass until it bursts into flame.—Albert Charles Pinkerton.

Old Wire Spool Makes Bean Shooter

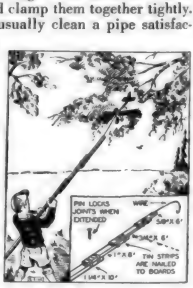
IF YOU can get hold of an old wire spool—the longer it is the better—and a strip of rubber from an old inner tube, you can make a simple bean shooter that will throw a BB or a small bean for quite a distance. The plunger is carved from any old thin piece of wood to the shape shown in the drawing at the right. Two notches are then cut in the front of the spool to prevent the rubber from slipping. To shoot, pull the plunger back, put a projectile in the hole of the spool, and let go.—Will Underwood.



Simple, Handy Pipe Cleaner

A HANDY pipe cleaner is no doubt one of the most serviceable devices known to pipe-smoking mankind. To make a simple cleaner, all you have to do is to fit a large round head screw into a chain link, as shown at the left, and clamp them together tightly. A couple of turns on the link will usually clean a pipe satisfactorily. For best effects, use as large a screw as you can get. This device will also serve to ream out a tight-fitting stem.—Ellsworth Farris.

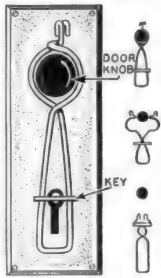
Retrieving Gliders from Trees



IF YOUR model glider gets lodged in a tree, and you are at a loss for a means of getting it down, you will find the task easy if you rig up the device shown in the drawing at the right. This contrivance consists simply of a number of pieces of small stock, of the dimensions specified, joined together with strips of tin and locked in place with small bolts. A hook made of a length of stiff wire is nailed to the end. When the glider lands out of reach, simply hook the wire around it and manipulate it gently until it falls to the ground.—Russell Oakdale.

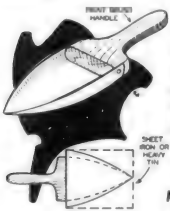
Stunts for the Handy Man

Wire Clip Prevents Burglars From Picking Lock



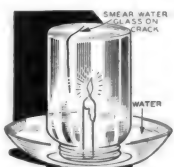
IT'S NOT in the least difficult for a burglar who knows his stuff to pick the lock on your door, even if the key's in it, and enter your house. But if said burglar runs up against a case where he can't push the key out of the lock he's stumped, and he will be stumped if you rig up the protective locking device shown in the drawing at the right. This is made from a piece of stiff galvanized iron wire about 1/16 inch in diameter and bent into the shape shown. To fit the protector onto a lock, first turn the key sideways and slip the wire up through it, and around the knob as illustrated. The key is thus held firmly crosswise in the lock.—Oscar Wimple.

Scoop With Brush Handle



THE handle of an old paintbrush that has been worn to a frazzle can still be of some service as the handle of a scoop. Procure a small piece of sheet iron and cut it to the shape shown in the drawing at the left to form the scoop proper. Then after bending the wide edge so that it will fit the handle, nail it in place. Such a scoop will prove rigid and serviceable.—Charles Davis.

Mending a Cracked Glass Jar

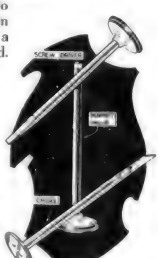


TO MEND a cracked glass vessel, set a candle in a dish of water, and invert the jar over the candle as illustrated at the right. When the flame has been extinguished by exhaustion of air, smear some water glass over the crack and allow the jar to set for several hours. The pressure of the atmosphere will force the water glass into the crack, where it will harden to make a watertight joint. Crocks and vases can be mended in the same way.—Oscar Lind.

Easy Way to Remove Dents From Furniture

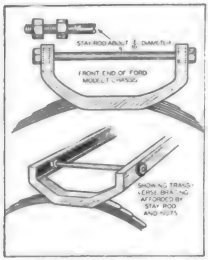
AVERY good way to remove dents or scratches from pieces of furniture is to heat a piece of blotting paper and fold it several times to form a pad. This done, soak the pad in water, place it on the dent, then apply a flat iron, as shown, to draw up the wood. —S. L. Bastian.

Old Auto Poppet Valves Make Serviceable Tools



A VARIETY of serviceable tools can be made from old automobile poppet valves by a few minutes labor at a grindstone. An extra screwdriver or chisel will always come in handy around the workshop, no matter how many you may happen to have already. First grind off the hollow head of the valve so that only the solid stem is left. Then grind off the tops to form the business end of the screw driver or chisel. Tools made from these valves have the advantage that they can be stood up in any place and can be found without any trouble. Gouges for small lathes can also be made from these discarded valves.—Walter E. Burton.

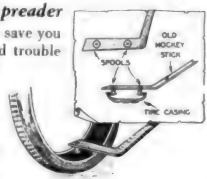
Ideas for the Motorist



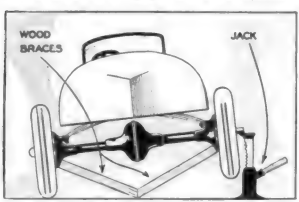
Stay Rods Strengthen Frame of Model T Ford

WHEN the frame members of a Model T Ford show any tendency to loosen, you can reinforce them with a stay rod in the manner shown in the drawing at the left. This rod, which consists of a piece of cold rolled steel about three inches in diameter, is placed behind the radiator. Each end of the bar is threaded to take the two nuts which are placed, one on the outside of the frame, and the other the inside as shown. In this way the frame can neither be spread outward nor pushed inward. Two or more braces may be added if necessary.—G. A. Luers.

Handy Tire Casing Spreader



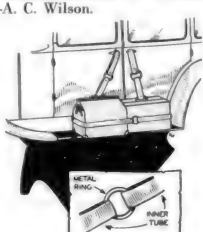
A CASING spreader will save you considerable time and trouble when you have on hand the job of inspecting the casing of a damaged tire. To make a simple spreader, simply bolt two rollers made of large spools, to the business end of a hockey stick, as illustrated in the drawing at the right. In use, the rollers are inserted back of the tire beads on either side of the casing and pulled around so that the casing is spread out. The casing is then rolled along the garage floor while the rollers keep it open for inspection.—Lester Young.



How to Remove a Tight Rear Axle

TO REMOVE a tight rear axle when you have no regulation wheel puller on hand, simply remove the axle nut, and jack the wheel up as illustrated in the drawing at the left. Then cut two pieces of plank and fit them against the wheel to be removed and against the opposite housing. Now, if the jack is let down slowly, and the end of the axle tapped lightly with a hammer, the wheel will loosen immediately.—A. C. Wilson.

Inner Tubes Make Straps to Carry Baggage



ROPES slip and loosen when holding baggage or such on moving vehicles, but straps made of old inner tubes will do the job quite satisfactorily. The rubber does not hold well if simply tied together, so rings must be used, as shown in the drawings at the right. The great elasticity of the rubber enables it, when tied in the saddle clinch knot, to hold the articles firmly together.—Emil Wolff.

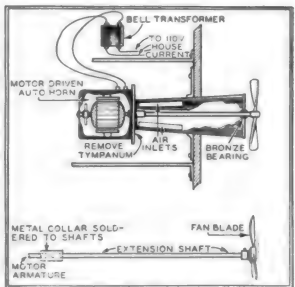
Case Packed With Grease Lubricates Joints

BRAKE rod joints can be kept well greased at all times by covering them with tubes made of light leather or inner tubes and packed with grease. The tube is tied around the rods as shown at the left.—J. N. Stoody.

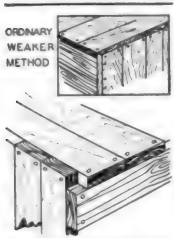
Workshop Kinks

Horn Motor Drives Ventilator Fan

THE problem of ventilating your blacksmith shop, dark room or kitchen can be solved in short order if you can lay hands on an old motor driven auto horn. The tympanum of the horn should first be removed so that the motor hub is accessible. To this hub, solder an extension shaft as illustrated in the drawing at the right, and on the outer end of the shaft fasten a small fan. Next cut four vents in the megaphone as shown, and finally secure the completed device to the wall. Hooked to the secondary of a small bell transformer, the motor will draw hardly any current and will run practically noiseless, provided the bronze bearings are kept well oiled.—John Edwin Hogg.



How to Build a Strong Crate

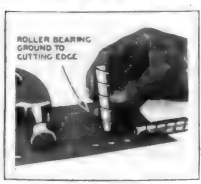


WHEN you are constructing a crate in which to ship something, remember that there is a weak way and a strong way to assemble the boards. When nailed together in the ordinary manner, as shown in the top drawing at the left, the crate is quite likely to come apart. A better way is to allow the members to overlap, as shown in the lower drawing. The result is a strong three-way tie-up that will stand a lot of punishment at the hands of baggage smashers.—William Villard.

Axe Wedge from Washer

A WEDGE that will hold an axe or hammer head firmly on its handle can be improvised in a few minutes from an ordinary washer. The washer is placed in a vise and one-half of its surface filed to a sharp edge, as shown in the drawing at the right. The sharp end is then driven into the head of the handle, that is, the end that is inserted in the axe or hammer. The hole in the center of the washer tends to keep it from working out of the wood. A medium-sized washer should be used.—Wesley James Drummond.

Roller Bearing Makes Punch



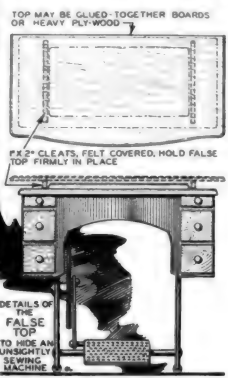
SMALL punches for pasteboard, thin leather, and other soft gasket stuff are often wanted in a hurry. To fill this need in a pinch, an old automobile roller bearing can often be quickly ground down to a cutting end to produce a neat, serviceable tool. The material in most bearings is pretty good and will punch out some pretty stuff repeatedly without loosing edge. Wads can be quickly removed through the hollow center with a nail or wire.—Frank W. Bentley, Jr.

Table and Sewing Machine in One

The false top is set on the sewing machine and the curtain draped around the edges as shown here.

A SEWING machine need not be an unsightly piece of furniture good for nothing but sewing, for by making a false top for it such as is shown in the above photo you can quickly convert it into a very presentable table. This top is made from a number of boards glued together or a piece of heavy plywood cut to the shape shown in the accompanying drawing. An ogee edge or an ordinary chamfer may be cut for ornamentation.

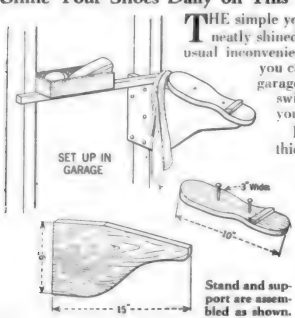
In order to provide an even support for the top, two cleats of the dimensions shown are screwed to the underside and their lower edges — the edges which rest on the machine—padded with felt. The lower part of the machine is concealed by means of a curtain suspended from small rods fastened also to the underside of the top.



Shine Your Shoes Daily on This Stand Before Getting Into Your Car

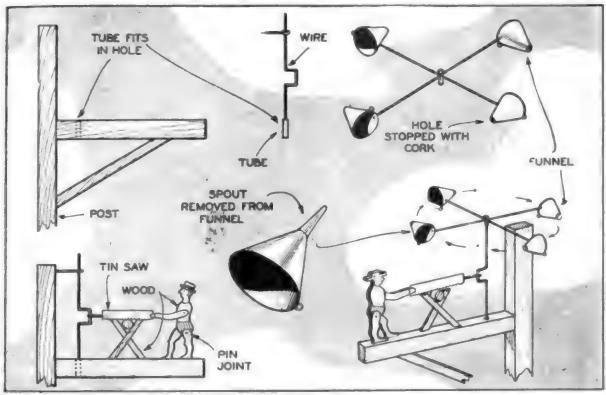
THE simple yet bothersome task of keeping your shoes always neatly shined can be taken care of each morning without the usual inconvenience of hunting the polish, brush, and stand if you can set up this simple shoe shining outfit in your garage. Using it, all you have to do is take a few swipes with the brush just before you step into your car.

Procure two pieces of board from stock one inch thick and cut them to shapes shown in the drawing at the left. One piece forms the support, and the other, which is shaped like the sole of a shoe, forms the stand proper. Across the heel portion of this latter piece nail a small strip to hold your shoe firmly in place. A box for holding the brush, cloth, and polishes of various colors should be placed nearby. A small shelf consisting of a simple strip such as shown in the drawing will be excellent. The entire stand is finally nailed to the wall.



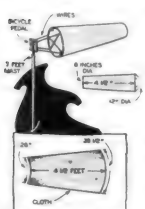
Stand and support are assembled as shown.

An Ornamental Anemometer



Novel anemometer is mounted on wood support, as shown. Revolving crank moves saw back and forth.

FROM four small funnels and some scrap pieces of wire and wood you can construct a novel anemometer for telling the speed of the wind. The spouts of the funnels are first removed and the holes in the flares stopped with corks. Then the flares are fastened to the ends of two stiff wires which are crossed as shown and attached to another stiff wire upright. This wire upright is bent in the middle to form a crank which is attached to the end of the saw held by the figure. The figure is cut from four thin pieces of wood. When the wind strikes the funnel flares, the crank will revolve, causing the figure to saw the wood.—Oscar Wills.

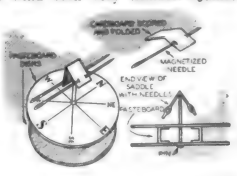


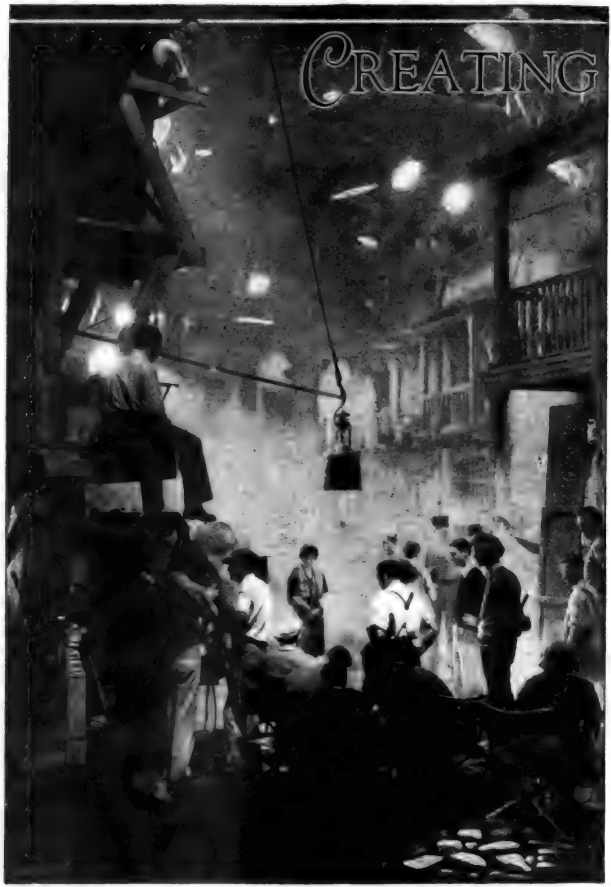
Easily Made Wind Sock for Home Weather Station

A WINDSOCK, which is an indispensable piece of equipment to any air field or weather station, can be made from a piece of heavy cloth and a ball bearing bicycle pedal as shown at the left. The cloth is cut to the dimensions shown and attached to a wire frame, which is in turn fastened to the bicycle pedal with four pieces of cord, as illustrated. The completed sock is finally mounted on a pole in a position where the wind can get a good sweep at it. The ball bearing pedal makes the wind sock very flexible.—James Schlager.

Improvised Compass

IN AN emergency an accurate compass can be improvised by arranging two needles on a pivot as shown in the drawing at the right. The saddle which supports the two magnetised needles is made from a folded piece of cardboard placed on the needle point so that it can revolve without friction. A compass card is marked off as illustrated.—William Doody.





This photograph shows how the illusion of distance is created in the studio by the use of smoke. A street set has here been erected right on the lot, the buildings in the distance, being made smaller to get the correct perspective, are set up close for convenience. A smoke screen completes the illusion.

Illusions for the Talkies

In this interior theatre scene you see the singer playing to a packed house. Only the first five rows, however, are real people. The rest is painted.

by MARY SHARON

You can't believe everything you see in the talkies, and it's a bit of luck for you that you can't; for these illusions lower production costs and help keep the admission price within your reach.

"IF THE mountain will not come to Mohammet, Mohammet must go to the mountain."

"But, most noble prophet, it costs too much to go to the mountain."

"Then we'll fake a mountain right here in the studio."

Faking mountains, or anything else you can think of, is now easily accomplished by what is known as Dunning Process Shots. This method has done more than any other one thing towards putting talking pictures within reach of the masses. By this process, a cameraman is able to turn out films that show upon them things that the camera eye never actually saw. Production costs have been cut in half by this method, since portions of costly sets can be eliminated simply

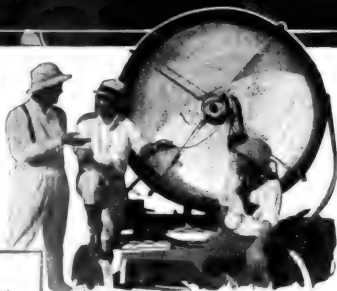
This is the type of sound-proof camera in general studio use in the making of talking pictures.

That Moonlight Garden Love Scene Doesn't Look so Romantic Here

by matting in on the negative whatever is needed.

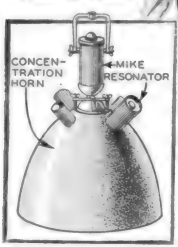
Hardly a single talkie has been released that has not made use of this process. The method is a difficult and painstaking one and numerous tests are necessary before the scenes will pass muster. Aside from cutting down expenses, there are many scenes that cannot be shot "as is." For instance, it is impossible to shoot night scenes showing stars. Any talkie showing stars has made use of the Dunning Process shots, which is a tedious method of covering a portion of the lens and matting in the desired background with stars overhead. This is doubly difficult with the advent of talking pictures, because it cannot be imperfect in any way. In silent pictures, if a few feet of the negative were distorted, the cutter destroyed the faulty portion and patched the negative to hide the missing part. Now, not a foot can be cut because even a misplaced or lost syllable would gum up the recording of the whole scene.

In order to make stars in a night sequence, tests are made of the scene, and the sky is blotted out by the simple method of covering the lens in that particular spot on the negative as is done in ordinary double exposures.



The invention of this giant selective beam microphone made outdoor talkies possible.

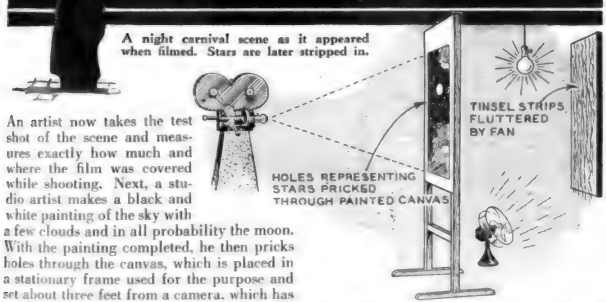
It is cheaper to build outdoor sets in the studio than to erect electrical equipment in the natural setting.



A profile drawing of one of the earlier microphones which catches sound waves from one direction only, enabling the director to prompt from rear.

The Moon and Stars Won't "Take", But You See Them Just the Same

A night carnival scene as it appeared when filmed. Stars are later stripped in.



The simple set up used in photographing the stripped-in synthetic stars in the scene above.

An artist now takes the test shot of the scene and measures exactly how much and where the film was covered while shooting. Next, a studio artist makes a black and white painting of the sky with a few clouds and in all probability the moon. With the painting completed, he then pricks holes through the canvas, which is placed in a stationary frame used for the purpose and set about three feet from a camera, which has been mounted on a concrete column to insure it against vibration and to have it always in readiness for use.

Fifteen or twenty feet behind the framed canvas is a board covered with strips of tinsel, arranged so that one end is loose. An electric fan is turned on the tinsel so that the loose strips wave back and forth and a strong light is placed between the tinseled board and the frame holding the canvas. The light coming through the pinholes photographs like twinkling stars.

By matting, location costs are cut in half. If a scene is supposed to occur in a valley, with mountains in the background, the artist is called in to mat in the required scenery.

William H. Dietz, ace of moving picture trick cameramen, has been responsible for many spectacular process shots. He is a licensed aviator, having learned to fly in order to be able to take desired sequences from the air. He found it impossible to tell another pilot just when to tilt his plane for the shots he wanted. Since he has learned to

Above is the railroad station scene in "What a Widow," with the background blocked out. Below is shown how the New York skyline has been stripped in by the Dunning Process in the final filming.

fly, he has had a camera mounted on the wing of his plane and equipped with an automatic release. When he gets the angle he wants, he pushes the button on his instrument board and the scene is recorded. For certain sequences in "What a Widow," Dietz spent five nights flying over the Pacific Ocean in order to get certain light effects on the water. A number of scenes are laid in the *Dornier* plane. Dietz secured the needed background and with the use of a small model of the *Dornier* he shot the sequences in the studio. The model was about two feet long. In the place of motors, it had small circles of isinglass. When the plane was moved about, the reflections on the circles looked like motors whirring, and the scenes were quite effective.

Painted mats were used for the backgrounds.

The same method was used in shooting the sequences of the *Ile de France* in mid-ocean. An exact model of the great liner was made which was about seven feet long. It was placed on the studio pool and waves were generated by immense paddles and by means of a small tube run up through the bottom of the model, smoke was forced out the funnels. The background of sky and waves was matted in and on the screen it looks as if the model were the great *Ile de France* in mid-ocean.

For the interior shots in the plane in this same picture, the Dunning Process was used. Two films were placed in the camera, one of them amber-colored, the other one blue. The interior of the plane was painted in different shades of amber and the back-drop outside was painted a brilliant blue. When the scene was filmed, the blue canvas outside the open windows of the plane did not register on the negative, being neutralized by the blue film in the camera. The actors wore a heavy amber make-up for these scenes and amber lighting was used to intensify the coloring of the set and the actors.

After such a scene is filmed and recorded, a test is made of it and this strip is given to the artist to compute the exact place on the negative where it is to be matted. Now, the film is placed in the camera and the lens is covered over the portion of the negative that was first exposed. The canvas on which was painted the background is now photographed. It usually takes about three days to achieve the desired result and dozens of tests are made before the negative is completed satisfactorily.

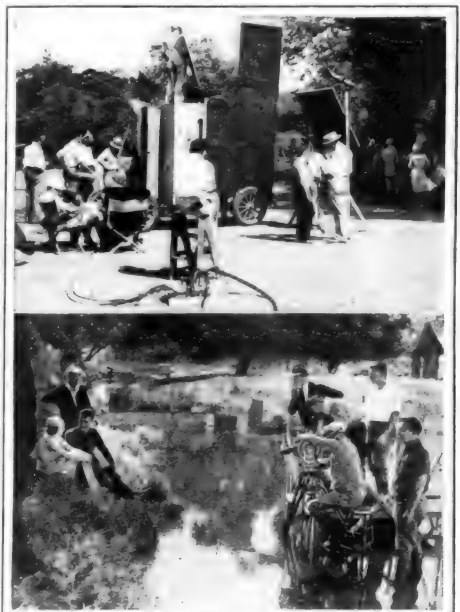
A number of scenes were required in this same production showing the Grand Central

station in New York and also the business district and sky line of New York. Dietz flew to New York, shot the background and matted it in behind the railroad scenes shot in Los Angeles, thereby saving the studio and Gloria Swanson the wear and tear and needless expense of taking the cast to New York and back.

With the aid of a prism lens, Dietz also introduces some spectacular scenes and titles for the Swanson production. A prism lens refracts a scene in the same way that a prism refracts light. Dietz shot a scene of a pair of hands playing on a piano and the prism lens recorded it as if there were six keyboards on which six pair of hands were playing, an unusual and striking effect.

He made the ballet scenes in "Paris Bound" with an ordinary lens in the same way that double exposures are made, by covering a portion of the lens and then exposing it later. Eighteen exposures were made. Standard size film is 32mm. wide. It can readily be seen how difficult it would be to compute exactly where the lens should be covered and where the actors should be placed on the set to prevent overlapping.

Miniature effects, which are another specialty of William Dietz, are secured through covering a portion of the lens and exposing the negative by degrees. Such scenes as those showing a man standing on the palm of a girl's hand or a ballet girl sitting on the rim of a wine-glass are secured through double and triple exposures.

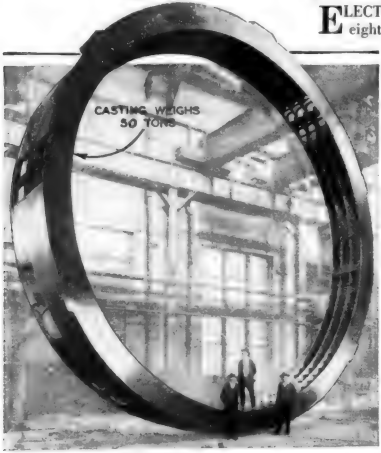


Talkies have complicated the technique of production. Above is shown the elaborate equipment needed for recording sound while below is the simple equipment used in filming "The Big Parade" in the days of the silent drama.

Wherever there is no motion on that part of the negative, matting can be done for a very small expenditure. It is used in practically all interior sets. Ceilings of ballrooms are almost always painted and matted in. So are chandeliers and the tops of columns and walls. The carpenters build the sets so that the walls extend several feet above the heads of the actors and the artist paints the rest. Columns are built which do not reach entirely to the ceiling and instead of wasting needless wood and finishing, the artist paints the

(Continued on page 192)

World's Largest Squirrel Cage Part of Huge Generator



This gigantic squirrel cage is part of a 57,000 h.p. generator.

ELECTRICAL engineers recently built eight of the world's largest mechanical squirrel cages, large enough to provide an immense squirrel cage for animals as large as Bengal tigers. However, each ring is 43 feet in diameter and weighs 100,000 pounds, so the animals would need to have the strength of prehistoric monsters to keep the cage whirling. To stand the great ring upright in the shops of the General Electric plant, two 100-ton electric cranes worked in unison.

Each of the eight rings will become a "castle for kilowatts," and will serve as the outer element of a gigantic electric generator. So large and heavy is the frame that it was found necessary to construct it in six parts, the sections welded together, with bolted sections to permit transporting the machine from the plant to the site of the new power plant. The frames were shipped unassembled and without the coils and windings which, due to excessive weight, could not have been moved as a complete unit. The world's largest waterwheels will operate these generators to generate 57,000 horsepower of energy.

Electrically Heated Teakettle

THE old family teakettle that so long held out against modernization has at last yielded to progress—it has had electricity installed in its innards, and can now strut proudly among its up-to-date fellow kitchen utensils.

The teakettle shown in the photo below, will prove indispensable for households where no hot running water is available. It is made of aluminum in 5 and 10 pint capacities, rapid heating being achieved by merely attaching the long flexible cord to the nearest wall plug. Hot water is thus provided quickly and without mess.

Water boils rapidly in this electrically heated teakettle.

The principle of its operation is the same as that employed in electric percolators.

Metal Receptacle Cleans Dry Mops

NO MORE need mops be shaken out an open window for cleaning. The dry mop cleaner, shown in the photo at the right, eliminates such messiness. The mop is cleaned by inserting its head in the slot of the cleaner, then twisting its head vigorously. This action removes the dust. Dirt that falls to the bottom is removed by tipping.

Messiness is avoided by shaking the mop in this metal receptacle.

THE AMATEUR ELECTRICIAN

Edited by
THEODORE ALLEN

Electricity is coming to be mankind's most useful and economical servant. Modern Mechanics and Inventions editors are always on the lookout to obtain plans for the construction of handy labor-saving devices that readers can easily build in their own workshops.

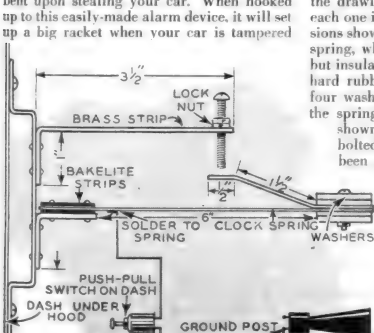
Magnet is wired up and hung from bumper as shown.

Magnetic Puncture Eliminator

NO LONGER need you worry about punctures if you hang two powerful electro-magnets from the front bumper of your car to pick up all stray nails, tacks, etc., that lie in the path of your tires. This simple magnet, the wiring diagram of which is shown at the right, consists simply of iron wire core wrapped with about 2000 turns of No. 26 double cotton covered wire, and hooked to the generator of your car. The magnets are finally wound with friction tape and hung, one on each end of the bumper, as shown in the photo above.

Vibrating Contact Alarm Blows Horn When Thief Tampers With Car

THE horn on your automobile can be utilized as a means of frightening a thief bent upon stealing your car. When hooked up to this easily-made alarm device, it will set up a big racket when your car is tampered with. The alarm device consists simply of a vibrating contact, constructed as shown in the drawing at the left. Three brass strips, each one inch wide, are first cut to the dimensions shown to serve as supports for the clock spring, which is fastened to the angle piece, but insulated from it by means of bakelite or hard rubber strips and bushings. Three or four washers are bolted to the other end of the spring, along with the contact strip as shown. The completed device is finally bolted under the dash to a spot that has been scraped clean to insure good contact.



Above drawing shows construction of the vibrating thief alarm.

The setting of the screw contact point is important. Turn the bolt down till the horn blows continuously; then turn it back till the horn stops, and tighten the lock nut. When a thief attempts to start the car the vibration will cause the contacts to meet, and operate the horn. The push-pull switch turns on the current to the device. It should be placed somewhere out of sight.

An Electric

Current is supplied to the mono-rail train through the two wires, which are suspended in the manner shown here.

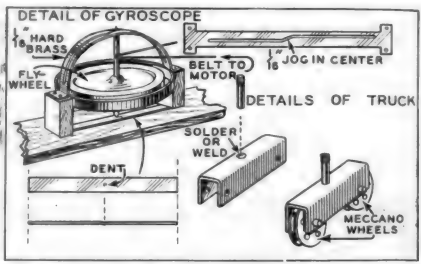


Fig. 1. The gyroscope and trucks are assembled as shown. The gimbals require careful adjustment. Four rubber bands will serve as a belt.

IT IS a well known fact among experimenters that when a whirling gyroscope is set in an upright or inclined position it will not change unless some strong exterior force is applied. Due to this peculiar quality, which is known as the precessive effect, the gyroscope can be utilized in the construction of many scientific instruments and practical devices which are used in every day life.

One of the most important uses to which the gyroscope is put is that of keeping a mono-rail train in an upright position as it speeds along on its single track. The most practical and outstanding railway of this kind is known as the Brennan Mono-railway, which is used in Ireland.

An interesting and instructive toy mono-railway working on the same principle as its big brother can be easily made by any home craftsman out of a few Meccano parts, an old six-volt toy motor, a bell transformer, a piece of No. 20 gauge sheet iron, an old sewing machine fly wheel, and some No. 14 bare copper wire.

The body of the train is made from the piece of sheet iron, which is cut to the dimensions given in Fig. 2, and nailed around the baseboard, as illustrated. A second piece of sheet iron can be cut to the required shape and soldered on the top of the cabin to serve as a roof.

From an old Meccano model builder set you can obtain the pulleys with which to make the trucks. Mount these wheels in the the two carriages cut from pieces of thick sheet iron bent into square cornered U's. Two small round headed stove bolts are used as hubs. The completed carriage is fastened to the bottom of the baseboard with threaded pins, which are connected with one terminal of the motor to provide contact with the rail-wire.

The next step is to construct the gyroscope, which in this case is kept extremely simple. The gimbal is made from two strips of sheet brass cut in the shapes shown in Fig. 1. The strip at the base has a dent punched in the center to hold the lower point of the flywheel hub. The upper strip is a little more complicated, however. It has a long, narrow slit cut in it, with a 1/16th-inch jog in the center.

Miniature Mono-Railway

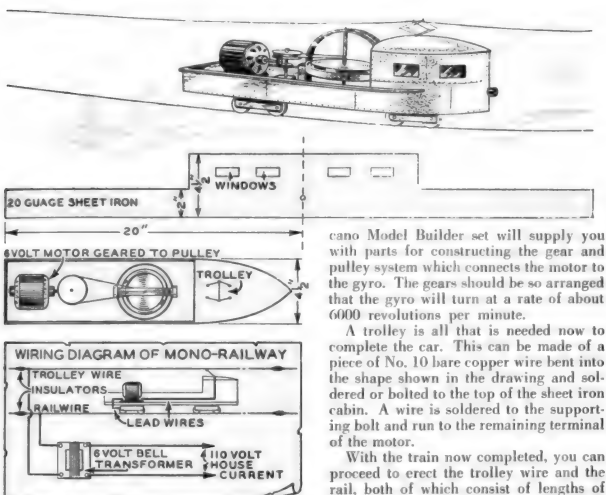


Fig. 2. Top view of car shows position of gyro and motor. Current for the motor is taken off the wires by the trolley and wheels, as shown in diagram.

The reason for this is plain on a little study. If the gyroscope is mounted on straight gimbals, there will be no turning or righting effect. But with the jog, or precession fork, the minute gravity attempts to sway the car the gyro hub hits the righting notch in the precession fork, bringing the car immediately into an upright position.

The flywheel from an old Model 10 Singer sewing machine will serve as a flywheel for the gyroscope. A small notch is filed in the hub to form the pulley, as shown in Fig. 1. As a driving belt, you can use four rubber bands.

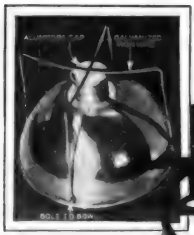
The gyroscope is driven by a six-volt electric motor which is mounted on the base board in the position illustrated. The Meccano Model Builder set will supply you with parts for constructing the gear and pulley system which connects the motor to the gyro. The gears should be so arranged that the gyro will turn at a rate of about 6000 revolutions per minute.

A trolley is all that is needed now to complete the car. This can be made of a piece of No. 10 bare copper wire bent into the shape shown in the drawing and soldered or bolted to the top of the sheet iron cabin. A wire is soldered to the supporting bolt and run to the remaining terminal of the motor.

With the train now completed, you can proceed to erect the trolley wire and the rail, both of which consist of lengths of No. 14 bare copper wire suspended in the manner shown in the accompanying drawings. Insulators are placed at both ends to avoid short circuits, and at the house end two leads are taken off and run to the secondary of a bell transformer, which supplies the current through the wires to the motor.

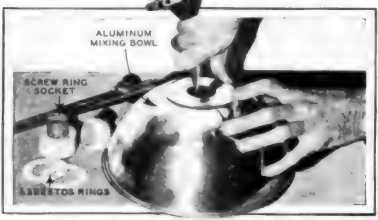
In running the car, you will have to allow several minutes for the flywheel of the gyroscope to pick up speed. This might take longer, as there will no doubt be a lot of slipping in the belt. When once it has worked up to a good speed, a gentle shove will send the train moving along the wire. To give a realistic effect to the car, you can paint it an aluminum color, and add a small headlight to the front. In case no bell transformer is procurable, you can use a six-volt storage battery or four dry cells in series. A control board is arranged as shown.

Warm Your Room With This Floor Type Electric Heater



The aluminum cap is held in place by means of the wire legs which are bent as shown here.

The heater can either be set flat to radiate heat upwards, as shown above, or set on its sides. The 600 watt screw base resistance unit fits into the socket in the bottom of the bowl.



The base of the screw ring socket is inserted in the hole, and the top then screwed on. The asbestos rings insure a snug fit.

ON CHILLY mornings there is nothing so comforting as a small electric heater that casts a sphere of radiant warmth throughout the room. The task of building one of these heaters is much more simple than it seems; practically all you have to do is to construct a reflector around a resistance unit, and hook the unit up to the 110-volt house current.

The first thing to do is to procure an aluminum mixing bowl to serve as the reflector. Fill this bowl with strong lye water and allow the solution to stand for about thirty minutes. The effect of this will be to produce a matted surface on the bowl, so that the heat is not concentrated in a beam, but reflected evenly in all directions.

Now, cut a hole in the center of the bowl of sufficient diameter to receive the screw ring socket, shown in the photo above. In screwing the socket in place, three or four layers of sheet asbestos should be placed around the metal to insure a snug, cushioned fit. Attach to this socket six or eight feet of asbestos covered heater cord, with a plug connector at the other end.

The outside portion of the socket is covered with an aluminum cap, made from a clothes sprinkler, about two inches in diameter, or any other cylindrical piece of aluminum that you may have available. The cord passes through a hole in the cap fitted with an insulating bushing. The cap is later held in place with the heater legs.

These legs are made by bending galvanized iron wire to the shape shown in the photographs above. The diameter across the bottom is eight inches, and the height is six inches. From the same material you can form the guards which are placed across the top of the bowl as shown.

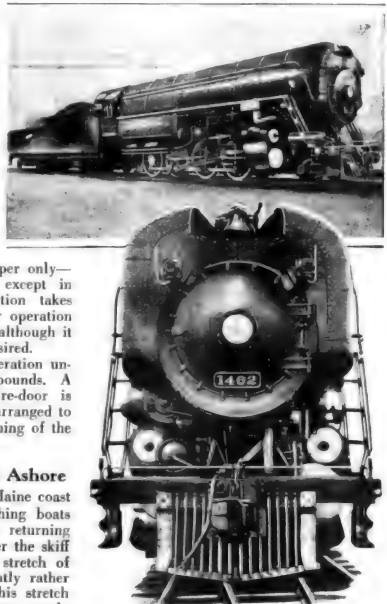
The guards and legs are secured to the bowl by means of four bolts inserted through loops in the ends of the wire and through holes in the bowl, drilled ¼-inch below the rim as illustrated. At the point where the wires cross they should be soldered.

Finally, equip the heater with a percolator handle, fastening it in position as shown.

Streamlined Locomotive Uses All Modern Improvements

"EFFICIENCY on wheels" might well be applied to the *James Archibald*, a freight locomotive recently placed in service in the east. The locomotive is stream-lined from the cab to the front of the smokebox—the smokestack and bell being thus hidden completely from view from the sides and rear. The headlight is placed in a recess in the smokebox front. Illuminated number plates are mounted below the running boards above the cylinders. A pneumatic quick-acting bell-ringer actuates the clapper only—the bell remaining stationary except in emergencies when hand operation takes place in the usual manner. Air operation also controls the steam whistle, although it may be manually operated if desired.

The boiler is designed for operation under a steam pressure of 500 pounds. A "butterfly" type air-operated fire-door is provided. Ashpan dampers are arranged to open automatically with the opening of the throttle.

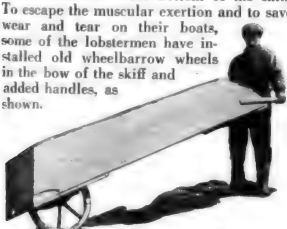


These two views show how locomotive designers have exerted their ingenuity in enlarging the modern locomotive while still permitting it to pass through the present tunnels and bridges. The smoke-stack, bell, whistle, and high and low pressure steam domes have been placed in the groove of the streamlined superheater.

Lobstermen Wheel Skiffs Ashore

AT MANY points along the Maine coast lobstermen keep motor fishing boats moored, going off to them and returning in small skiffs. If it is low water the skiff must be dragged down a long stretch of shingle or beach that is frequently rather rough and rocky, or back up this stretch to a safety point above high water mark.

Not only is it a long, hard drag but the rocks are bad for the bottom of the skiff. To escape the muscular exertion and to save wear and tear on their boats, some of the lobstermen have installed old wheelbarrow wheels in the bow of the skiff and added handles, as shown.

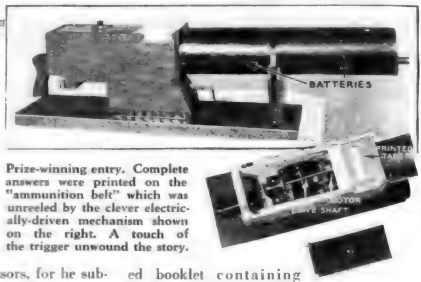


A skiff inverted for wheeling up the beach.

Holding Small Articles in Vise

LIGHT work is readily held in a large vise if you lay a small block or flat piece of wood on top of the vise jaws, hanging two piston rings on this so that they come between the jaws. The small work can then be pinched between these rings. Several turns of string around the bottom of one of the rings will bring their tops squarely together.

Final Flying Contest Winners



Prize-winning entry. Complete answers were printed on the "ammunition belt" which was unreeled by the clever electrically-driven mechanism shown on the right. A touch of the trigger unwound the story.

BEFORE the curtain rings down on the last of the "Win Your Wings" contests, permit us to introduce the winner of the final free flying course given by Fawcett Publications, Inc.

Fred G. Seidel, of Box 333, Taftville, Conn., is the last of the Follies Beauties, but his victory is perhaps even more deserving than any of his predecessors, for he submitted an entry in each of the thirteen contests. But instead of becoming discouraged with repeated failures he continually improved his entries, until in Contest No. Ten he was awarded second prize. He slipped a little in the next two, only making the roll of honor, but with only one more try he came through with the highly original entry pictured above to win the grand prize.

Second prize, a Scully Windtite aviator's helmet, goes to Cedric E. Galloway, who lives at 610 South Fourth Street, Austin, Minn., for his neatly typed and beautifully illustrated booklet containing complete and well written answers to the contest questions.

Joe Petrak, of 3977 East 42nd Street, Cleveland, Ohio, wins a pair of Dictator non shatterable goggles as third prize. This prize was won as a result of some clever poster art which illustrated his book of answers. Either of these two booklets might have won a flying course in one of the earlier contests, but with the steady improvement shown by all, it took a real genius to walk off with the grand prize in the three or four later contests.

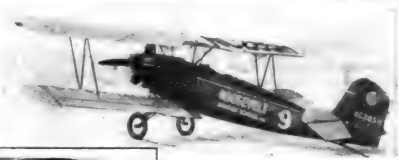
Fred G. Seidel, of Taftville, Conn., submitted the entry shown above.

Cedric E. Galloway, of Austin, Minn., won the second prize.

Joe Petrak, of Cleveland, Ohio, walked off with the goggles.

Roosevelt School Trains Winner

Although the "Win Your Wings" contests are over, the prize winners of the later contests are still receiving training. Here's the dope on the school picked for winner No. 10.



One of the Consolidated Huskies used for primary training. This is the same type as is used by the U. S. Army.

All courses given at the school are accompanied by actual shop work. Here's one of the classes in wing construction.

Here is a group of students in the motor overhaul class. An effort is made to turn out practical men who have had some real experience when they graduate from the school.

THE Roosevelt Aviation School, located at Roosevelt Field, Mineola, Long Island, has been selected as the school at which Richard K. James, the winner of Flying Contest Number Ten, will receive his free flying course.

Roosevelt field is the most active commercial airport in the world, housing over 200 planes of all sizes, types and vintages, from huge tri-motored Fords to primary gliders. It was from this field that Lindbergh, Byrd and Chamberlain started their memorable ocean flights, while Frank Hawks, Art Goebel and Martin Jensen have inscribed Roosevelt Field boldly on the pages of aviation history with their outstanding accomplishments.

Roosevelt students have association not only with this large and varied number of historic and commercial planes, but also with unusual experimental types. The entries in the Guggenheim Safety Contest were daily visitors at the field, while helicopters and other experimental types come to the field for trials.

In order that the tremendous commercial activity at Roosevelt Field may not interfere with instruction, the airport is divided into two units, the larger being devoted solely to training. The unit's shortest runway for takeoff is 2200 feet and its longest 4400 feet. The field is equipped with one of the finest lighting systems in the country, thus enabling instruction in night flying and landing. Situated as it is in the midst of the Hempstead Plains, it is surrounded by numerous fields ideally adapted for forced landings. Training in forced landings is a fundamental part of the Roosevelt curriculum.

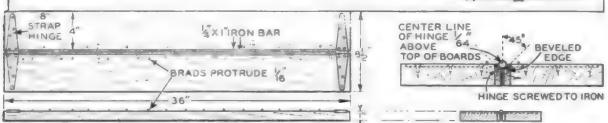
The flying equipment is the most modern obtainable. Roosevelt School has selected its training planes because they possess an unequalled record for safety and simplicity in operation. Its primary trainer is the product of a well known manufacturer.

Home-Built Tracks

by DICK COLE

You'll add immeasurably to the fun you'll get from your toy train if you build these extra tracks and bridges for it.

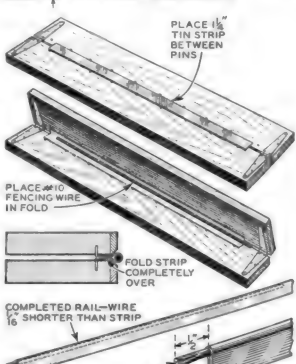
Photo by American Flyer Co.



UNDOUBTEDLY thousands of boys throughout the land will be the recipients of electric trains for Christmas. It is safe to say that no other toy offers such a wide field for experimentation. However, the initial gift usually includes only the electric locomotive, a string of cars, and a comparatively short length of oval tracks. The novelty of seeing the train go 'round and 'round soon wears off. In fact, probably two weeks after Christmas, many electric trains will be stored away in the closet—forgotten.

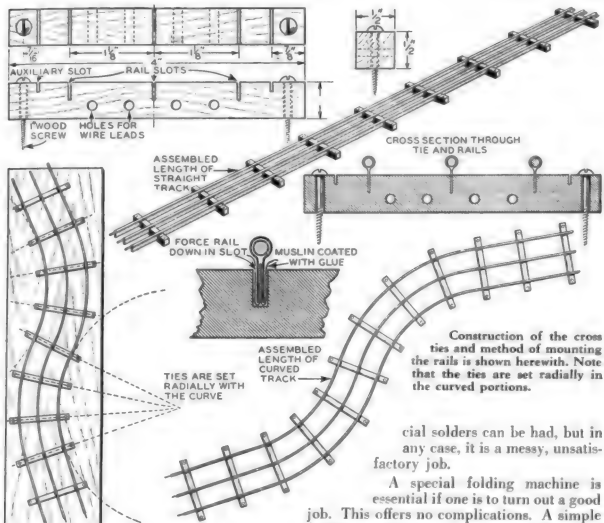
The makers of electric trains provide many accessories to add to the original train and trackage. The acquisition of these will prolong the novelty of the train, but, even so, one's enthusiasm finally wanes. But if one makes one's own accessories, there is almost an unlimited field in which to work. And, too, there is an added satisfaction in the possession of creations of one's own handicraft.

In this article I shall tell how additional equipment can be made by any handy boy



Details of the board for folding the track.

for ELECTRIC Trains



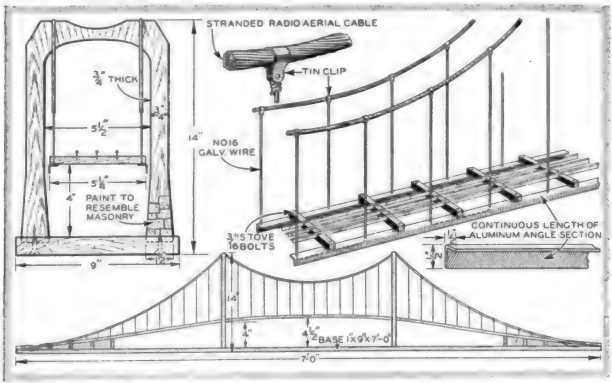
Construction of the cross ties and method of mounting the rails is shown herewith. Note that the ties are set radially in the curved portions.

at a small cost. The first need which will be apparent to any owner of an electric train is more trackage. This can be made very easily. Strips of any sheet metal about 1/8" thick will serve. But, in this case, some provision must be made for uniting the rail-ends to form a good electrical connection. The method adopted by all manufacturers of having a plug on one rail enter the tubular end of the other rail, is simple and affords a good contact, so I shall show how to make that style of rail.

Practically any thin, sheet metal can be used for the rails—copper, brass, galvanized iron, common tin. The latter is recommended. Sheet aluminum can be used, but there are some points in the fittings which should be soldered, and aluminum does not lend itself readily to soldering operations. Special solders can be had, but in any case, it is a messy, unsatisfactory job.

A special folding machine is essential if one is to turn out a good job. This offers no complications. A simple folding machine is shown in the drawings. This consists of two hardwood boards 1"x4"-x36" hinged together at the extreme ends only. The joining edges of the boards are faced with strips of 1/4"x1" iron. The edge of the iron is beveled off at a 45-degree angle, as shown in the enlarged end elevation. The center-line of the hinges should be not more than 1/64" above the top surface of the boards. Obviously, the straps of the hinges are set into the boards. When the hinges are closed, the boards should be almost flat together.

After the boards are permanently hinged together, a row of pins made with small brads is set out on each board 5/8" from the hinge line. The distance between the rows is 1 1/4". The heads are cut off the brads and they are filed down so as to protrude only 1/16" above the surface of the boards.

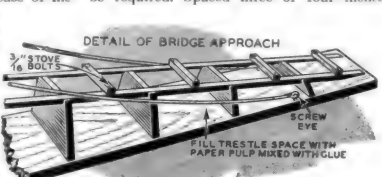


This suspension bridge is really suspended, and strikingly lifelike. The slope is not too steep for an electric train to overcome. The drawing makes all details of construction clear, including dimensions.

Next, a sheet of common tin is cut lengthwise into 1¼" strips. These are placed, one at a time, into the folding machine. The boards are then folded over to a right angle. A length of 10 gauge fencing wire, 1/16" shorter than the strip of tin, is laid in the fold, and the boards are closed over flat. The result of this folding is a length of rail. Light tapping with a hammer may be necessary to close the tin tightly around the wire. The wire will have been set in the fold so as to protrude ½" at one end. This wire can be bought at any hardware store, and is kept in stock in coils of big diameter. Do not roll it into a coil of smaller diameter or it will be harder to straighten. In the case of the middle rail, which serves only as a current conductor to the motor in the locomotive, the protruding end is split and spread like a cotter pin to afford a better contact between rails. In fact, it is a good policy to employ this method on all rails.

Next we shall take up the making of the cross-ties and assembling of the trackage. The plan, side and end elevation of a cross-tie are shown. These should be made of hardwood dressed on all sides. White maple is particularly recommended. The three slots to receive the rails, and the screw-holes at each end will be obvious to everyone. The two smaller slots, and the four additional holes will play their part later in operating some of the accessories. They should be made now, as it would be very awkward after the tracks are assembled.

There is no fixed rule for spacing the cross-ties. If they are placed very close—about an inch apart—the tracks will more closely resemble real railroad tracks. But, in this case, a great number of cross-ties will be required. Spaced three or four inches



Detail of the bridge approach, showing how the suspension cables are mounted. Paper pulp mixed with glue gives it solidity.

apart, they will serve their primary purpose equally as well.

The rails are secured to the cross-ties by gluing. Direct gluing between the metal and the wood would not prove very satisfactory. But if the lower part of the rail is wrapped with a strip of muslin copiously covered with glue, and is then forced snugly into the slot, a lasting glue job can be done. Boiled or cold glue can be used.

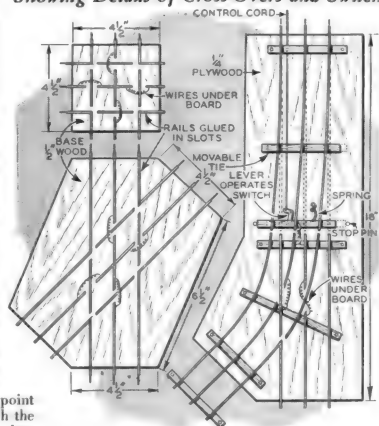
Curves, of course, are essential in laying out any railroad. After a length of straight track has been formed, it can not be bent into a curve. Each curve must be separately shaped, and is a rigid, fixed length of trackage when done. Any curve to be laid out is first computed on a board or a table-top, and the pattern marked out. The cross-ties are then screwed temporarily to the surface. On a curve, the ties always point to the center of the circle of which the curve is a part. In other words, they are set radially. After the ties are screwed down temporarily, the rails are shaped into the slots and glued as in the case of the straight trackage. After the glue has set, the screws can be removed from the cross-ties, and the trackages will be a rigid assembly.

Next we shall take up cross-overs and switches. One of the drawings shows an ordinary right angle cross-over. After one has familiarized one's self with the method of making tracks, the making of the cross-overs will be quite obvious. Rather than cutting the slots in the cross-ties, the slots are cut directly in the block of wood which serves as a base for the cross-over. Suitable short sections cut from rail lengths are set in the slots by the glue and muslin method.

A 45-degree cross-over is also shown. This is really a modification of the right angle cross-over and requires no detail explanation. The same fundamental design is adhered to for any angle cross-over and for multiple track cross-overs.

Another drawing illustrates a switch. This is different from the ordinary railroad switch. But there's a reason; chiefly because the shape of the rails of the miniature railroad will not readily permit tapering them off to a point. And, too, the third rail offers additional complications in copying truly the "big railroad" switch. But the one illustrated will serve its purpose adequately.

Showing Details of Cross-Overs and Switch



A right angle and a 45-degree cross-over, together with a switch, are shown in this detailed drawing.

Assuming that the builder has already made cross-overs, and is becoming more adept at handling the material, the construction of the switch will offer no difficulties. The switch is permanently mounted on a piece of ¼" board—wood, plyboard or even plaster-board. A 12" length of straight track is made up with only three cross-ties. One end of this track is secured rigidly to the base board. The other end can be sprung the fraction of an inch necessary to bring it in line with the other track. The drawing shows a little lever which actuates the switch from a remote point by pulling on a cord. When the cord is released, the switch returns to its "straight away track" position.

No railroad would be complete without bridges. Probably a suspension bridge intrigues the mind more than any other. The suspension bridge shown not only looks like one, but is a truly suspended bridge, embodying many of the factors—except provision for expansion—that are found in an "honest to goodness" bridge.

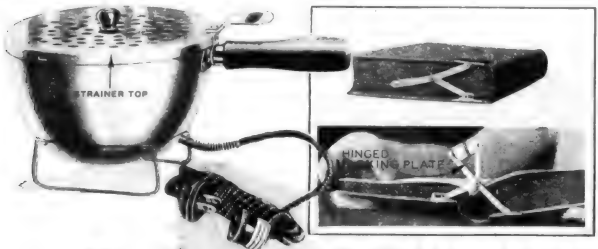
MECHANICAL AIDS

Frame work of furniture of the latest design is being made from aluminum or seamless cold-drawn steel tubing plated with gleaming chromium, and upholstered along extremely simple lines, as shown in photo above. This tubing is practically indestructible and is easily kept clean and bright, thereby almost eliminating the task of dusting.

Milk thieves are foiled with the device shown below. Bottles are slipped through opening into a self-locking container in rear.

An attractive accessory for the modern kitchen and bathroom is this new rustproof holder for household cleanser cans, which has recently been placed on the market, and is available in twelve different colors. The container will hold almost all household cleanser cans and forms part of the vast array of mechanical household aids that inventors have devised for the purpose of making the home more attractive as well as relieving the busy housewife of many of her burdens. In this modern age, inventors are doing their utmost to reduce the effort necessary to perform the tasks that fall to the housewife's lot.

for the Modern Housewife

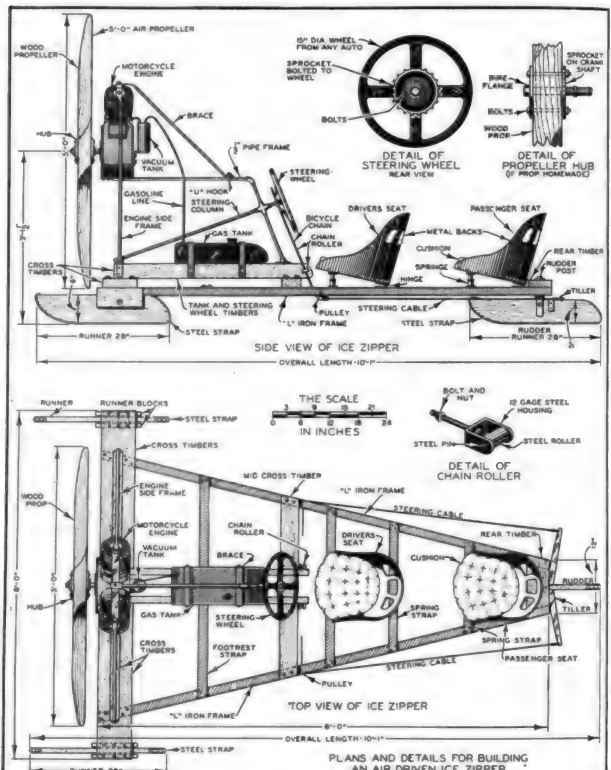


Above—This device automatically marks the page when you close the book. Left—The new electric cooker fitted with protective legs.

Left—Apples are cored and quartered in a split second with this new cutter. It consists of four sharp blades, which, when thrust down through the center of an apple, cut it for eating or cooking as shown. Right—The new filter which removes all impurities from city water.

This handy grill, recently placed on the market, makes it possible for the housewife to prepare an entire meal right at the table. It can be used to toast sandwiches, fry eggs or pancakes, or broil or grill steaks or bacon. The grill is heated by electricity, drawing very little current.

Motorcycle Engine POWERS



Details for the construction of the chassis and the mounting of the engine are given in the drawings above. The sides of the chassis are made of 1½-inch pieces of angle iron, and the cross pieces, of strap steel. One-half inch pipe serves to brace the motor. No brake is used, as sufficient braking can be produced by cutting the engine and drifting in against the lazily rotating propeller. Any marine supply house will provide you with parts for making the steering apparatus. The driver should make turns fairly wide. Spark and throttle controls are left up to the builder.

HIGH-SPEED ICE ZIPPER

This air-driven Ice Zipper, powered by a two-cylinder motorcycle engine, will carry two passengers and do 50 m.p.h. easily.

by **L. B. ROBBINS**

There are few thrills equal to that of speeding over the frozen surface of a long lake in an air-driven ice sled. Utilizing an ordinary two-cylinder motorcycle engine you can easily construct this 50-mile-an-hour Ice Zipper and get the most exhilarating sensation known outside of actual flying.

HERE you are—you air-minded gang! A real speed wagon for use on a long, hard frozen lake. With one of these Ice Zippers you can get all the thrills of flying over the ice while hanging close to ground level. All you need is a high speed motorcycle engine, an air propeller and the mechanical ability to assemble the chassis and put the outfit in tune. With a motor capable of developing 1000 R.P.M., forty to fifty miles speed can be easily realized, and when you see the ice slipping under you at that rate you will know you are going some.

First, let's tackle the construction of the chassis, which is shown in Fig. 1. This is triangular in shape and eight feet long. The sides are composed of two pieces of 1½-inch pieces of angle iron separated 5 feet at the front and one foot at the rear. Bolt a 2x6 plank across the front ends and a shorter piece across the rear, with ends tapered to suit the angle. Then bolt a second timber, made from 2x4 stock on edge along the center of the first front plank, using long bolts at frequent intervals to give strength to these two cross timbers. The lengths of these timbers are shown in the drawings.

The engine frame is composed of two nearly upright pieces of angle iron bolted to the center of the top cross timber and separated so as to be slightly farther apart at the bottom than at the top. They are braced by two

Braking Is Effected by Coasting Across the Ice Against Idling Propeller

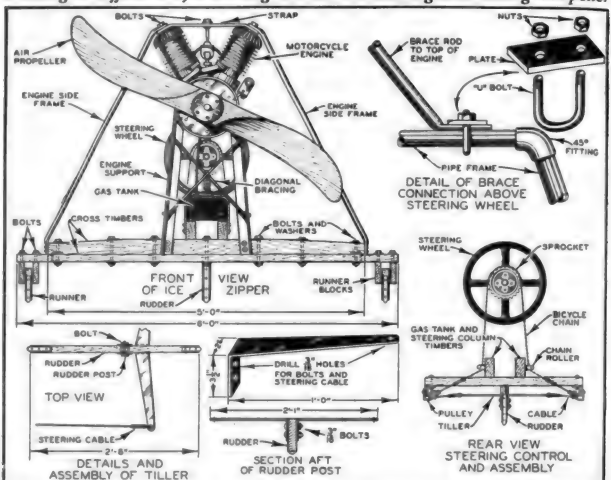


Fig. 2. Front view of ice sled shows bracing of engine and construction of runners. The steering cable is hooked to the two metal arms bolted to the rudder post. A prop guard should be provided for safety.

tie rods crossed near their centers. The top ends should be cut out to fasten securely, with lag bolts, to the crank case of the engine. The engine itself is a two-cylinder motorcycle engine of sufficient power and speed for this purpose. A four-cylinder engine can be used nicely instead and will run steadier and smoother, but the corresponding support and bracing system will have to be worked out differently by the builder.

A brace in the form of a steel strap is bolted across the two cylinder heads, and then from each head a side brace of ½-inch pipe fashioned to lead down to the ends of the top cross timber. Each end of the pipes is flattened and drilled for bolts so that these side frames can be bolted to the cylinder heads and ends of the timber. The engine is now held vertically and from the sides. The rear pipe frame takes up the end thrust and acts as a support for the steering wheel.

This part is composed of half-inch pipe about the size shown. Flatten the end of a piece and bolt to the under side of the engine crank case. Add a 45° fitting, and then, by a nipple, Tee, long nipple and marine flag pole flange, make the rear vertical assembly slanting as shown. Tie the top of the engine to this horizontal pipe by a round iron rod bolted to the center of the cylinder head strap and to the pipe by the U clamp shown in Fig. 2. By this means, the exact vertical line-up of the propeller can be adjusted.

Two pieces of 2x3 about 3 ft. 6 in. long should then be bolted against the rear face of the top cross timber and run back parallel and four inches apart to bolt to a second wooden cross timber, called the mid-cross timber. Bolt the frame flange to a block bolted between these two parallel timbers. Also mount a motorcycle gas tank to these timbers with straps and bolt a steel strap across the frame under them for a foot rest for the driver. A vacuum tank is mounted on a shelf on the rear of the engine and the gas line led down to the tank outlet.

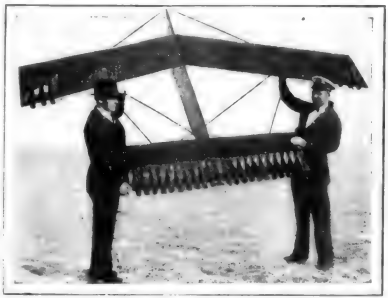
The seating capacity is taken care of by procuring two old bucket seats from an old style racing car or plane and mounting them

(Continued on page 198)

650 Miles an Hour Expected From Metal Rocket Plane

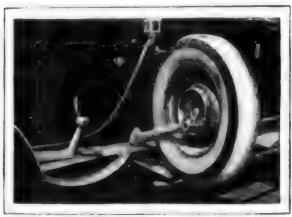
TO eliminate the fire hazard which has hitherto embarrassed the designers of rocket planes, Maurice Poirier, inventor-designer, and Franklin L. Wallace, pioneer aviator, have been conducting experiments at Los Angeles with two all-metal models which have been built to withstand speeds up to 650 miles per hour.

These models are each equipped with 38 steel-cylinder rockets, ten of which are used for driving and 28 for stabilizing or balancing. Three of the latter type are placed on each of the wing tips and will be used in much the same manner as ailerons, while the other rockets are installed on the tail. The combined rockets will develop 21 horsepower, enough to propel a man-carrying plane.



Maurice Poirier and Franklin L. Wallace with one of their all-metal rocket plane models with which they are working.

Spare Carrier Swings Out of Way



The new spare tire or wheel carrier swung out of the way to permit mechanics working on the engine. Note the lock casting and the handle.

INTENDED to eliminate crowding the engine space for mechanics and at the same time to assist in easily unmounting a spare, a new type of tire and wheel carrier recently appeared on the streets of Detroit.

While the car on which the tire carrier was mounted had a specially designed step plate instead of the conventional running boards, the new device is adaptable to production-made cars. The carrier is fitted to a swinging arm and housed over a swivelling cap joint, and a new type of locking device.

Timing Device Speeds Up Punts

IN ORDER that he might dispense with the stop watch and devote his entire attention to watching the form of his kickers and centers, and correcting their faults, Vic Kennard, assistant coach at Harvard University has designed a machine which will automatically time punts.

The center places the ball on the arm extended along the ground. When the ball is snapped back the arm flies up and starts the timing device. In two seconds the bell rings, by which time the punter is supposed to have gotten away his kick. The timer bears the name of "Coachamatic."

Roger H. Hallowell, Harvard center, is shown using the device while the inventor watches. The timer is entirely automatic in operation.

Huge Drum-Shaped Speaker on Auto Advertises Theatre

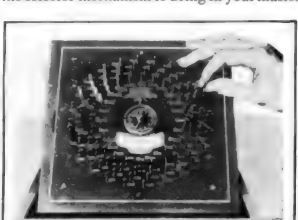
This huge speaker, shaped like drum, advertises Berlin theatre.

THERE seems to be no end to the ingenuity of advertising men; they pop up everywhere with devices that attract attention by their novelty and ingenuity. An outstanding case in point is that of a Berlin advertising man who has rigged up a novel contrivance on an automobile that creates widespread gaping as it travels through the streets of Berlin. The car, shown in the photo at the left, has mounted on it a powerful loud speaker in the form of a huge drum, on the heads of which are painted the actors of the feature attraction. Announcements, music, etc., are furnished by a gramaphone hooked to the speaker. At night, the attractiveness of the device is accentuated by means of vari-colored lights arranged inside the drum. The driver operates the speaker.

Automatic Broadcast Tuning Switch

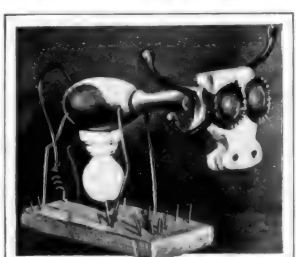
ULTRA-MODERN broadcast receivers are now being equipped with selectors by means of which listeners-in can tune in hours in advance on the programs they wish to hear. The control board, shown in the photo below, consists of a number of pull-out levers, arranged like the spokes of a wheel, with each spoke representing a certain hour of the day, and each switch, a series of stations.

When you wish to tune in on a program from a certain station, merely reach for the hour spoke and pull out the lever to the station desired. Then when the program comes on the air, the clock in the center operates the selector mechanism to bring in your music.



Listeners-in can tune in programs in advance by pulling out levers to time and station desired.

"Woolworth Cow" Eats Wire Grass



Amusing toy exhibited by well-known sculptor.

ALEXANDER CALDER, New York sculptor and artist, recently gave an exhibition of his work at the Fifty-sixth Street Galleries. Although many fine works of art were shown, the amusing toy novelties of this versatile craftsman attracted the largest share of attention.

Using scraps that may be picked up around any home and every day articles purchased from the five and ten cents stores, Calder constructed many startling novelties. The "Woolworth Cow" shown here was made of a wooden darning egg, a door bumper, coat hangers, bottle tips, rubber tips and wire.

SPARKS FROM THE RADIO EDITOR

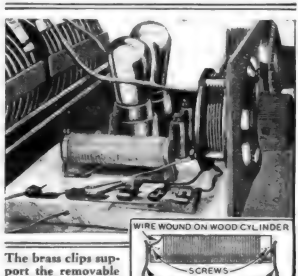
Edited by

L. B. ROBBINS

In the pages of this department you are always certain to find some ideas and stunts that will aid you in increasing the efficiency of your radio apparatus. Mr. L. B. Robbins, Modern Mechanics and Inventions Radio Editor, is constantly on the lookout for new and helpful ideas.

Handy Mounting for Choke Coils

IF YOU are confronted by a need for interchangeable radio frequency choke coils in your short wave transmitter, you can solve the problem by rigging up the simple mounting shown in the accompanying photo. The mounting consists simply of two brass clips screwed to the baseboard, as shown, with leads taken off at the screws which fasten the prongs to the wood.



The brass clips support the removable choke coil, as shown.

The choke coils of varying sizes are wound on wood cylinders, which can be cut from window shade rollers. The ends of the wires are hooked to flat-headed screws driven into the ends of the cylinders for the purpose of providing contacts with the brass mounting clips.

Plug and Jack on Receiver Enables You to Listen in With Headphones

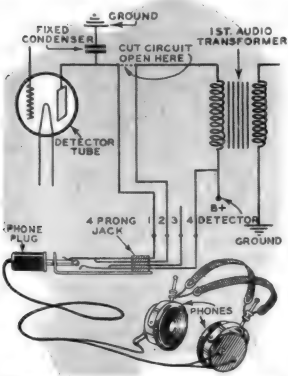
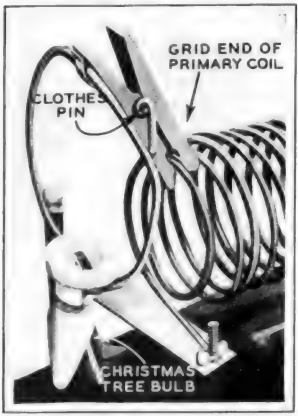


Diagram shows how jack is hooked into circuit.

SOMETIMES you may want to listen in on some particularly interesting program, but find that you are prohibited from doing so because there is sickness in the house or because others are trying to sleep. The only way out of this difficulty is to rig up a plug and jack system on your receiver so that you can listen in with a pair of phones, and thus do away with the disturbance caused by the loud speaker.

The only parts you will need are a phone plug, a four prong jack, and, of course, the pair of head phones. The jack should be placed at any convenient point in the cabinet or panel and the prongs marked 1, 2, 3, and 4, as illustrated in the wiring diagram at the left. Now find the wire connecting the plate of the detector tube socket to the terminal marked P on the first audio transformer. Open the circuit at this point and hook the wires to prongs 1 and 2 as shown. Prong 3 is left unused, but prong 4 is hooked to the B+ post of the audio transformer. With the plug in, the current passes through the phones; out, the circuit is normal.

Simple Test Loop and Holder to Determine Tube Output



The test loop is held conveniently in place by means of the brass clip on end of clothespin.

RADIO amateurs who are interested in the transmitting end of the game occasionally have to make tests of the oscillator to determine the output of a certain tube or the neutralization of an amplifier. In making this test, a loop is usually coupled near the oscillating coil. As holding this loop in position is very inconvenient, it is advantageous to devise a simple holder.

A very efficient loop may be made by connecting a flashlight bulb in series with both ends of a turn of No. 14 insulated wire, as shown in the photo at the left. Next, to make the holder, screw a small brass strip to the end of a clothespin and clamp the clothespin on the oscillating coil as shown. In testing, the loop is held conveniently in place by inserting it in the brass clip, this leaving the hands free to adjust the circuit. The bulb is lit by induction from the coil.

Radio Fosters International Peace

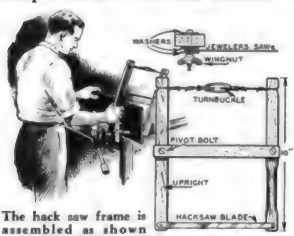
NO OTHER agency has such a great potential influence as radio for creating the necessary atmosphere for peace between nations, is the opinion of Mr. J. E. Smith, of the National Radio Institute. "Time and distance are banished by radio, and racial prejudice is rapidly melting," Mr. Smith says. Broadcasting is thus creating friendliness.

Device Regulates Tone of Speaker

MANUFACTURERS of radio equipment have put on the market a device by means of which it is possible to regulate the quality of the tone of any ordinary broadcast receiver. In use, two leads from the device are hooked across the grid terminals of the power amplifier tubes. Turning the dial controls the tone.

Device regulates tone quality of any broadcast receiver.

Simple Hack Saw Frame Enables You to Saw Through Panel in One Cut



The hack saw frame is assembled as shown above. The blade is pulled taut with turnbuckle.

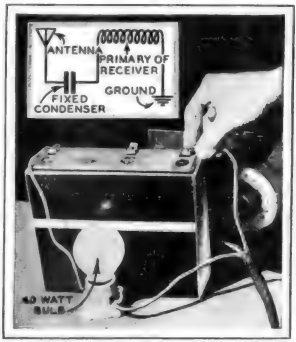
TO MAKE a hack saw frame with which you can saw through a panel neatly in one cut, select two uprights about ten inches long and notch them as shown in the drawing at the left. At the bottom of each piece drive a stiff steel pin, bending them back slightly towards the outside edge. Then, across the middle bolt a third piece, which should be the length of the blade to be used. Next, arrange the wire and turnbuckle on the uprights, as shown, place the blade over the pins, and draw up on the turnbuckle until the blade is stretched taut. Jewelers' saws can also be used by arranging the washers and wingbolts on the uprights as illustrated.

Protect Your Tubes Against Blowout From "B" Batteries

BURNING out tubes by the accidental passing of current from the "B" supply through the filaments is a common occurrence among radio experimenters and repair men. Such expensive accidents can be avoided by taking the precautions suggested here.

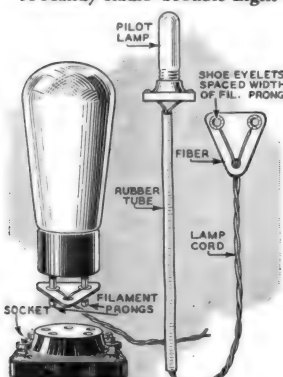
If you are testing a set while it is connected to the power source, the aerial and the ground, be sure that no other sets are connected to the same antenna, ground and power supply. If you cannot be sure of this, it is advisable to connect a large capacity condenser in series with the aerial or ground lead, as illustrated in the wiring diagram at the right.

Another way to protect the tubes is to interpose a resistance in series with all "B" power terminals. Electric bulbs rated at 25 or 40 watts are excellent. Use one bulb for every hundred volts.



To protect tubes, hook a fixed condenser in antenna circuit or bulb in "B" battery leads as shown. One twenty-five or forty watt bulb should be used for each hundred volts of plate current.

A Handy Radio Trouble Light



The light is hooked up to the filament as shown.

A SIMPLE trouble light for inspecting the apparatus inside a cabinet when something goes wrong can be made as shown in the drawing above. Two brass shoe eyelets are riveted to two holes in a triangular piece of fiber, and wires run from these rivets to a small pilot lamp, as illustrated.

Rheostat Stops Give Exact Voltage

HERE is a handy kink for the user of a set in which rheostats are utilized for filament control. Many times it is desired to change tubes, using either two and a half, three, or five volts. So, instead of guessing at the correct voltage each time, arrange a means whereby the correct voltage can be obtained each time a tube voltage is changed.

Shut the rheostat off, insert a tube of say three-volt filament rating. Place the terminals of a voltmeter across the socket terminals and gradually turn on the rheostat until the voltmeter reads three volts. Then drill a small hole in the rheostat next to the arm and insert a metal pin. This prevents the arm going any further. Proceed the same for two and a half volts, five volts or any other voltage you may wish to use, marking all holes with identifying marks for reference.

The pins can be marked on the back for the voltages.

The stop pins in the rheostat base halt the arm to deliver any voltage desired.

Collapsible Airplane Wings Are Made of Rubber Tubing

Here are the three inventors at work with a bicycle pump inflating their rubber tube airplane wings.

AIRPLANE wings that may be folded up, when the ship is stowed away in the garage for the night, and pumped up again in the morning with a tire pump, are the invention of three Washington men. Three large rubber tubes, covered with fabric, form each wing. At present they have been developed for glider use only, reducing weight.

New "Light Piano" Using Photo Electric Cells Creates All Musical Sounds

ONE of the most amazing musical instruments ever known has been recently invented by Prof. Arthur C. Hardy of the department of physics at the Massachusetts Institute of Technology. The device looks like a grand piano with a three octave keyboard, and it is not much larger than an ordinary card table. It is described by its inventor as: "an instrument in which beams of light and a photo electric cell have been utilized to produce entirely new musical sounds by optical means."

This new instrument can imitate sounds of all existing types of musical instruments, including wind, string, and percussion. The inventors hope that the symphony orchestra of the future will be able to utilize a dozen or so of these new pianos in place of the customary 75 or 100 men.

The heart of the "light piano" is a glass disc on which are recorded photographically a number of concentric sound tracks. This disc is rotated rapidly in front of a photo electric cell, as shown in the photo at the right, and light from a small lamp is allowed to pass through the sound tracks, thereby generating currents in the photo-electric cell that are amplified and fed into a loud speaker. The pitch of each note is determined by the number of wave lengths on each sound track.

Sounds of all musical instruments are produced on this "light piano." A photo electric cell picks up the light shining through the rapidly rotating disc, which has concentric sound tracks.

New Conveyor Carries Bags on Revolving Spiral Tubes

A NEW portable and flexible power driven elevating and tiering conveyor has just been introduced that has found many applications in a wide range of industries. This "Twinveyor," as the manufacturers call their machine, operates on a new principle—two external spiral tubes turning toward each other over the entire length of the unit. Anything placed on these spirals travels forward rapidly, perfectly balanced, under the power of a motor at the head.

A standard unit consists of six eight-foot dual sections and a power head. Additional sections may be joined to the main unit with an automatic lock.

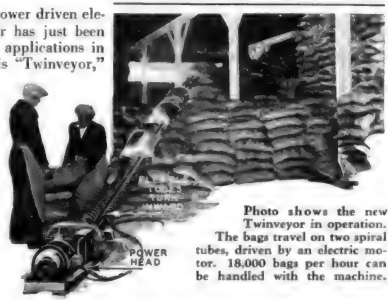
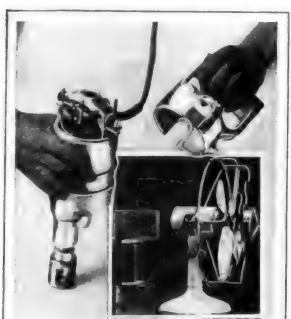


Photo shows the new Twinveyor in operation. The bags travel on two spiral tubes, driven by an electric motor. 18,000 bags per hour can be handled with the machine.

Tiny Motor Does High Power Work



Tiny, high powered motor shown above—a recent German invention—can be used for many purposes. Comparison with match boxes shows its size.

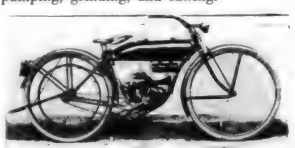
AN EXTREMELY high powered motor—that is high powered considering its size—has been developed by German manufacturers. This motor is built to serve a multitude of purposes; it will run anything from fans to electric drills. The motor is shown in the photo above, which gives some idea of the size, by comparison with the matchboxes.

Light Weight Engine for Bikes

WEIGHING only twenty-one pounds, including a Bosch magneto, a tiny gas engine has been built by a Chicago inventor that will drive a light weight motorcycle carrying a full grown man a distance of 150 miles on a gallon of gasoline, at a maximum rate of thirty miles per hour. This engine is valveless, has a two stroke movement, and develops one and one-half horse power. The magneto also supplies electricity for lighting the lamps.

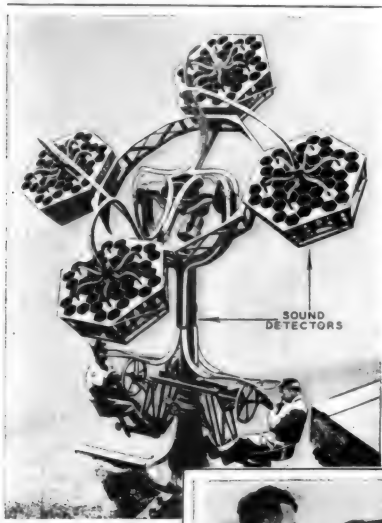
Although the cycle complete weighs only 84 pounds, it is unlike the typical bicycle frame, for the frame with which the tiny engine is employed must be specially shaped to fit the motor, and must be sufficiently strong to withstand operating strains. Power from the engine is conveyed to the motorcycle by means of chain and belt transmission.

The engine used in this motorcycle is also finding wide application for such uses as pumping, grinding, and sawing.



The small 21-pound gas engine shown above drives a bike 150 miles on a gallon of gas, at 30 m.p.h.

SCIENCE Combats AIR RAIDERS



French engineers have devised what amounts to a gigantic ear, which is composed of a number of highly sensitive sound detectors. Operated by two men, this device locates the enemy plane, indicating its height, flying speed and distance.

American engineers, however, have come out with a much more efficient and compact anti-aircraft weapon. This device has three functions—it locates the target in space, predicts the position of the target during the time of the flight of the projectile, and computes, in a split second, the data for fuse setting and super-elevation, which is transmitted to the gun crew on dials.

The director, as the device is called, is contained in a box-like housing mounted on a trailer. It is equipped with an optical height finder which measures the height of the target, and small tracking telescopes that follow the plane in its flight.

During recent tests, a sleeve target was completely riddled by anti-aircraft guns.

French engineers have devised this gigantic ear, which locates planes and gives the flying speed of such planes.

The device shown above, perfected by American engineers, locates the plane, follows its flight, and transmits firing data to gun crew.

WITH the perfection of airplanes as effective weapons in times of war, there must go hand in hand the perfection of devices that can fight off attacks from these aerial destroyers. Aeronautical and acoustical engineers have attacked the problems presented with a fury, and as a result of their efforts two highly efficient devices, which are shown in the photos above, have been perfected which in the next war will make life hazardous for enemy planes.

HOME WORKBENCH

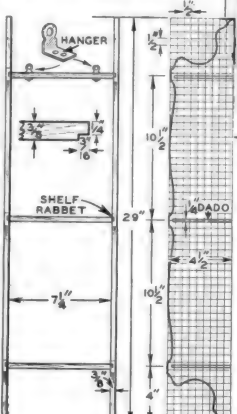
Edited by A. NEELY HALL

Modern Mechanics and Inventions readers are fortunate in having Mr. A. Neely Hall as editor of this monthly department. Mr. Hall is nationally known as author of such outstanding books as "Carpentry and Mechanics for Boys," "Outdoor Boy Craftsman," and several others.

Attractive Wall Bookshelf and Bric-a-Brac Holder

THE attractive little wall rack described here will serve as a bookshelf and bric-a-brac holder in one and make a very serviceable furnishing for your room. All you will need to build the rack is three pieces of ⅜-inch stock, a 58-inch length of plywood, and two hangers.

The dimensions of the parts required in making the rack are shown in the drawing below. The pattern for the sides has been ruled off into squares to simplify enlarging. Make a similar but full-size set of squares by drawing horizontal and vertical lines with a spacing of ½ inch, and then reproduce the lines of the pattern upon the large squares exactly as shown. As the upper and lower halves of the side pieces are identical, it will only be necessary to draw one-half of the pattern and trace it off above and below the center. Cut the side pieces with a coping-saw, and smooth up the edges with a half-round wood-rasp and sandpaper.



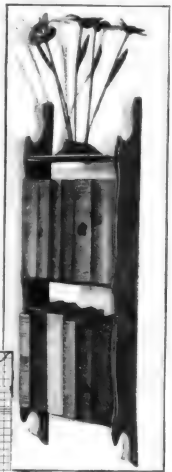
The pattern for the sides is laid out and parts assembled as shown above. The rack is supported by the hangers.

Cut the shelf boards to the width shown, making it 7⅝ inches in length. The length provides for 3/16-inch end rabbet, as the ends are to be let into the side pieces as shown. Cut the depth of the rabbets with a saw, and pare down to this depth with a chisel. Finally smooth the cut surfaces with sandpaper.

Using a chisel, make the dado cuts in the side pieces of the correct width and depth to receive the shelf ends.

When all parts have been cut and sanded, coat the shelf ends with glue and drive them into the side pieces. Then reinforce with finishing nails.

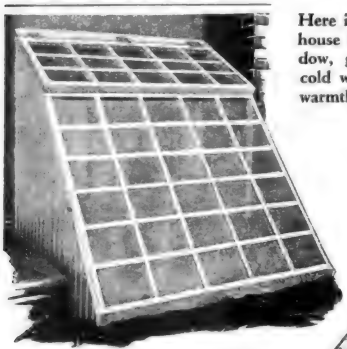
Now buy a pair of brass hangers at a hardware store, bend them into angles, and screw to the under side of the top shelf, as shown.



Completed rack makes an attractive holder for books and bric-a-brac.

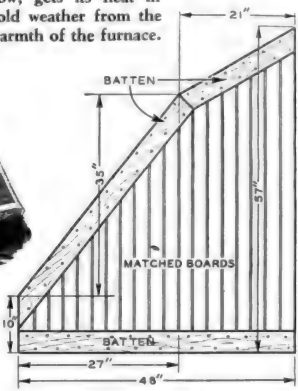
This rack should be finished in Chinese red, jade green or apple green, or gunmetal gray. You might stripe the edges of the side pieces and shelves with gold if you use red, or with silver if you use gray. Use lacquer or a quick-drying enamel. Before applying this, shellac all surfaces and sandpaper smooth. Then the two coats of lacquer or enamel will be sufficient.

A Basement Window Greenhouse



Exterior of the completed greenhouse. The lower sash is fixed, the upper one hinged for ventilation.

Here is an easily constructed little greenhouse that, built over the basement window, gets its heat in cold weather from the warmth of the furnace.



The end sections are built up of matched boards battened together on inside face, as shown above.

HEATED by the air from the basement, the novel little window greenhouse shown in the photograph above is a worth while investment for one fond of year-round gardening. Here plants may be grown or kept through the winter, and seeds and bulbs may be started in flats and pots for transplanting outdoors as soon as the danger of frost is past. A window with east or south exposure is best.

By building the window greenhouse as nearly airtight as possible, you can have ample heat in colder weather. By covering the inside of the greenhouse walls with insulation material, and preparing straw mats to throw over the sash at night, there should be no difficulty in keeping plants from freezing. But for the duration of cold waves, with temperatures below zero, plants may have to be transferred to a bench in the basement.

The diagrams show a cross-section of the window greenhouse, and the photo, the front elevation. Notice that the front sash of the greenhouse is fixed, but that the top sash is hinged for ventilation purposes.

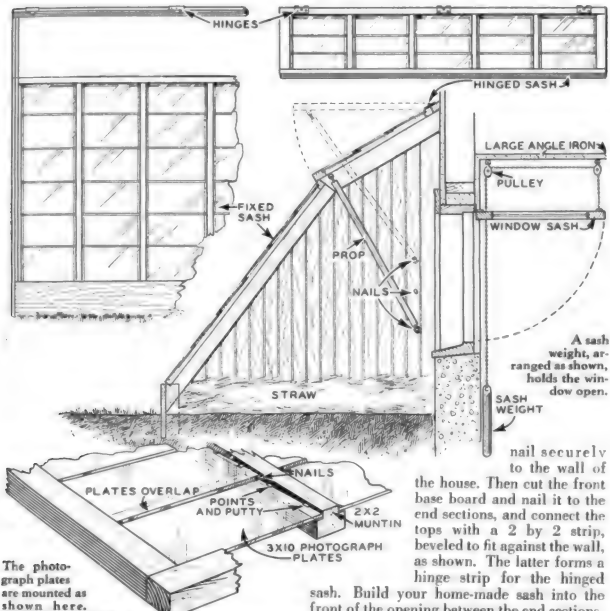
The size of the greenhouse enclosure will be determined by the size of sash you can get for the top and front. Maybe you have storm sash which will serve the purpose, or can pick up some sash of stock size at a local lumber yard.

However, you can easily build a sash yourself by following the plans in the accompanying drawings. Frames are made of 2 by 2's, with edges rabbeted to support the glass plates, which are made from photograph plates, 8 by 10 inches in size. You can probably get what you need of these from a professional photographer.

In setting the glass plates in place, embed the side edges of the glass in putty, laying them with front edges overlapping, as illustrated. Apply a thick coat of white lead to the lapped edges to provide close, airtight contacts. To keep the glass from sliding forward, drive nails into the front edges of the side and intermediate vertical members of the sash. Drive in glazer's points along the sides, and run in putty in the usual manner.

The end section of the greenhouse is shown in the photograph and accompanying draw-

Old Used Photograph Plates Serve as Lights in This Novel Greenhouse



The photograph plates are mounted as shown here. The points and nails at the edges of the plates hold them firmly in place. Prop sticks are attached to hinged sash as shown.

ing. Alter the dimensions, if necessary, to suit the sash procured for the job. The sections are built up of matched-and-beaded ceiling and battened together on the inside face with 1 by 4 boards. You may substitute shiplap here, or square-edged boards with battens nailed over the joints. Make the sections high enough so that six inches or so can be set below the surface as protection against rats.

When you have built the pair of end sections, stand them in position on each side of the basement window, with correct spacing. Plumb them, brace temporarily, and nail securely to the wall of the house. Then cut the front base board and nail it to the end sections, and connect the tops with a 2 by 2 strip, beveled to fit against the wall, as shown. The latter forms a hinge strip for the hinged sash. Build your home-made sash into the front of the opening between the end sections, or fasten the purchased storm sash between the end sections, flush with the top edges. Then set the top sash in place, and hinge it to the top hinge strip.

The drawing above shows the stick prop arrangement for raising the hinged sash for ventilation. Place two interlocked screw eyes in the upper end to hinge the stick to the sash, and put a screw eye in the lower end to slip over nails driven into the end wall. This arrangement holds the sash open at any width desired.

Provide outside hooks for holding down the hinged sash in freezing weather, and fasten weather strips inside of the opening. Finish the outside woodwork with a coat of paint.

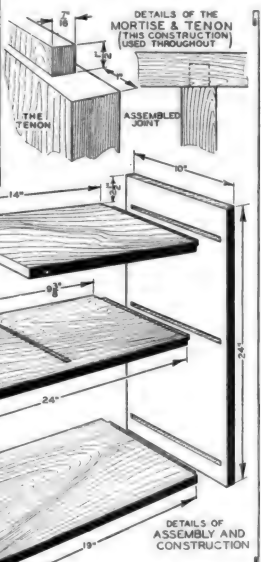
A Modernistic Arm Chair Book Stand for Your Room

This modernistic arm chair book stand is neat, simple and attractive in appearance.

IF you possess a few simple tools such as a chisel, a saw, a hammer and a square, and an ability to cut mortise and tenon joints, you can quickly transform a ten-foot walnut or sapgum board into a modernistic stand for holding your favorite books and magazines. The board, which should be ten inches wide and ¾ inch thick, is cut into six pieces of the dimensions specified in the accompanying drawing, allowing ½ inch for the tenons. Each saw cut should be carefully tested for squareness and the mortises and tenons chiseled out accurately to form snug, even fits.

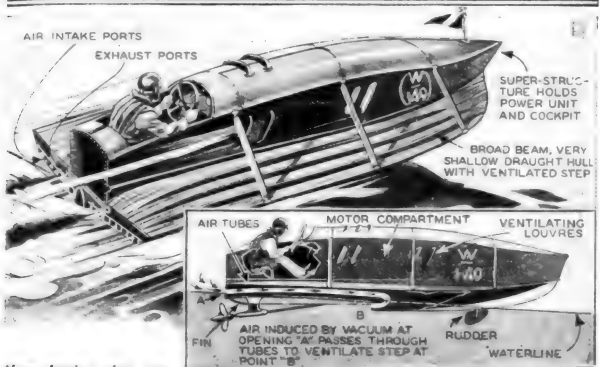
When the various members have been cut to size, apply a coat of good quality glue to the sides and bottoms of the mortises and tap the pieces home, one at a time. Then apply a coat of walnut stain or clear shellac to the entire surface of the case, and when dry rub it down vigorously with fine steel wool. Finally wax the surface to give a fine finish.

The dimensions given below are only suggestions. If you have a set or two of favorite books, you can change the dimensions to suit the space required. A few simple lines can be painted on to enhance the modernistic effect. Such a stand fits in well with an outlay of other modernistic furniture and is most handy when placed beside an arm chair or divan.



The six pieces composing the book stand are cut to the dimensions shown above. All saw cuts should be tested for squareness and the mortises and tenons for snugness. The joints are held together with glue.

Radical HYDROPLANE Wins Trophy



Above drawings show construction of superstructure, ventilator pipes and forward rudder

AT THE International Trophy Race recently held in Detroit, a hydroplane embodying distinctively new principles in boat construction, made its appearance. Designed and built by Mr. Hubert Scott Paine, well known British marine motorist, the boat is expected to upset a number of theories in connection with racing boat design and practice.

An outstanding feature of the hydroplane is the hull and superstructure, both of which are built up on a deep rigid center girder along lines followed in airplane fuselage construction to cut down wind resistance. The boat has little or no freeboard and is awash aft when at rest.

The six-cylinder Scripps engine is installed just aft the superstructure, this giving a more obtuse angle to the propeller, which the builder believes to be more efficient. The installation of the rudder up forward, and the unique plan of the hull as shown in the drawing, also accounts for other important qualities that the boat displays—a wonderful turning capability, surprising stability in any kind of seaway, and extraordinary trim when running at high speed.

The engine is so installed that every part is easily accessible for adjustment of the motor. The cockpits have also been restricted to minimum dimensions.

Note here the construction of the hull, with air intake ports across the stern.

The "Miss Britain I" undergoing her final trial at Southampton, with Hubert Scott-Paine, the designer, at controls.

It's EASY to BECOME a

by

JAY EARLE MILLER

In the second section of this complete course in gliding, the author discusses free flights and takes you on to the thrilling sport of soaring.

These three photographs show three different types of landing gears used on popular secondary gliders and sailplanes. Above is the standard Heath light plane undercarriage used on Ed Heath's biplane glider which first performed the unpowered loop and now holds the record.

PART II

The one-wheel landing gear used in Frank Hawks' transcontinental glider.

The Bowlus sailplane uses Goodyear air wheels.

LAST month we left off this glider flying instruction course at the point where the students had begun to make short free flights, cutting loose from the auto tow rope at altitudes of 20 or 30 feet.

With the 300 foot length of half-inch manila generally used in primary training you can attain an altitude of 150 to 200 feet in a field big enough to give a car run of about 600 feet. Allowing for the length of rope, that means you can cut loose at least 900 feet from the down wind edge of the field, so, until you have mastered turns, it isn't safe to go up that high unless you have plenty of room ahead for a landing. Right and left banked turns—a figure "S"—or 180 degree turns, with downwind landings, can be made safely with a 300-foot launching rope. Unless the student is exceptionally light or the gliding angle of the ship exceptionally high you will hardly be able to get a 360 degree turn at such low altitudes.

The first turns tried are moderate banks left and right or right and left, with landings into the wind. As the ship turns across and down wind in the first part of the "S" you need a steeper gliding angle and more speed. You must always remember that downwind speed and downwind landings must be faster than those upwind by a speed equal to twice the velocity of the wind. In other words if you take off into a ten-mile wind and your normal ground speed gliding into the wind is 20 miles an hour, you will have to go 40 miles an hour down wind, and land at twenty miles more than your normal landing speed.

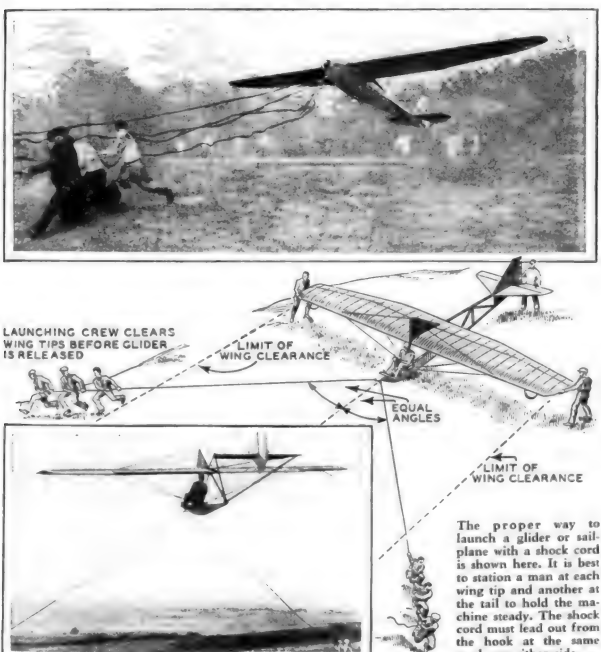
The chief thing in turns is to learn to bank properly and not skid the ship. Skidding is the chief fault of glider pilots, in fact it is so common that some perfectly good pilots

Licensed GLIDER PILOT

have claimed a glider should be skidded. The best answer to that is that a skid always involves loss of flying speed, and is therefore more or less dangerous. You will never get by a department of commerce inspector until you can bank properly and avoid skidding—or its twin evil of banking too steeply and slipping inward. After a few turns you get the knack of feeling a skid or a slip and correct automatically.

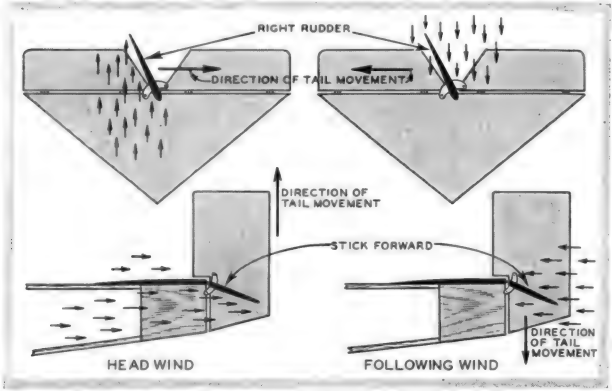
The only flying instrument on a glider is the seat of your pants, and a good pilot learns to fly by the way the seat feels.

Next to skidding the worst habit is taking turns in too flat a glide. You sense that by the fact that the controls feel "sloppy" and don't give the quick response that they should. The remedy is to nose down and pick up speed. With the altitudes that can be obtained with auto towing there is no reason for trying to stretch your glide to get more distance. And it is always easier to bring a



The proper way to launch a glider or sailplane with a shock cord is shown here. It is best to station a man at each wing tip and another at the tail to hold the machine steady. The shock cord must lead out from the hook at the same angle on either side.

Landing and Towing Down Wind Has Tendency to Reverse Controls



Why downwind towing and landings must be faster than those upwind by a speed equal to twice the velocity of the wind. As these drawings show, a following wind acts upon the controls in exactly the opposite direction to a head wind, and therefore require reverse control—Too much for a beginner.

ship around smartly and complete a turn if you have good forward speed than it is to make the same turn from the same altitude while trying to stretch your glide and hold the ship off the ground.

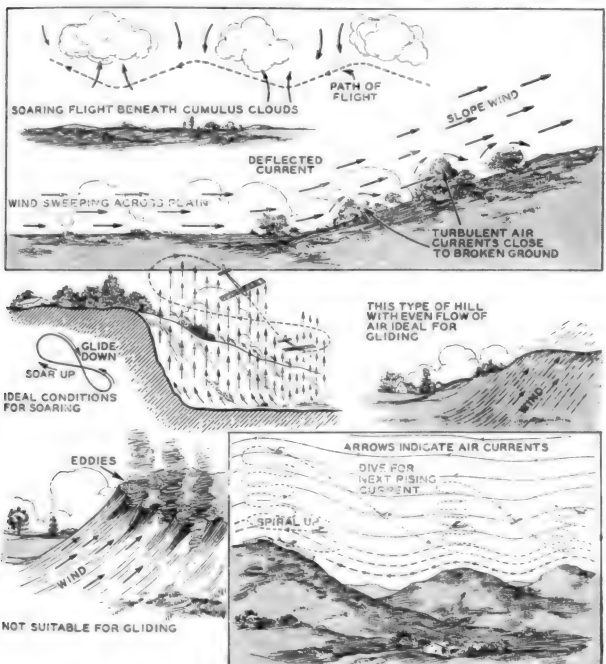
With practice in turns it is possible to hang on the rope longer until you are well down to the opposite end of the field, then turn back in a wide "S", getting well back and down before you turn back into the wind and complete the second half to the figure and make your landing. At that stage, on a 700 foot rope, you can get altitudes up to 500 feet or perhaps more, if you have a sufficiently big field to give space to climb the ship. With that altitude you can make a 180 degree turn, level out and glide back over the starting point, do another half turn and land at virtually the same spot from which you took off. Or, if you lose too much altitude you can land downwind, if you come in with sufficient speed to offset the wind on your tail. Downwind landings are avoided with airplanes except in emergency because of their relatively high landing speed, but with gliders they are habitually practiced, as are cross wind landings when the wind is not too strong nor too gusty. Just before sun down, when the wind usually dies away to a mere breeze is the best time of day to try them.

Flying back to the starting point speeds up the training, as the car can dash back at much higher speed than if it was towing the glider. Towing down wind is an art in itself, and in a high wind requires plenty of skill and training. With the wind behind you your controls are crossed until you pick up speed of at least five miles faster than the wind. That's because the overtaking wind strikes the control surfaces and exerts pressure in the opposite direction from that exerted by wind from in front. If you pull the stick back, which raises the elevators and normally causes the tail to go down, the wind from behind, striking against the flippers, will lift the tail, and if you forget to use the opposite rudder in a strong gusty wind while trying to tow downwind behind the automobile, the tail may surprise you by blowing around in front, the opposite wing tip skid will dig into the ground, and probably will be badly bent or broken.

Another don't when you are on the ground and the tow rope is attached to the glider and the car: Never take your feet off the

rudder bar. In fact it is best to bolt strap loops on the bar to fit over your feet and keep them from being bounced off while towing. Several glider pilots have been injured by taking their feet off the bar before the glider has come to a stop, or while the car is coming back to start the next flight. The rope may catch on a peg or a tuft of grass or weeds, jerk the machine sideways, and an unwary student will have his feet run over, or suffer a broken ankle or leg. The best practice is to keep your seat after the glider comes to a stop, if the rope is attached, and wait until the car has returned and come to a stop. Then take your feet off the bar, unstrap your belt, and get up and turn the ship around.

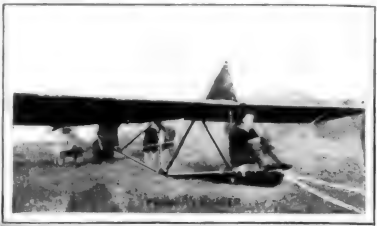
Precision landings, within a certain distance of a flag or marker, are not as hard as



These drawings will explain the action of air currents better than a whole book of text. The top panel shows how cloud formations may be used in soaring flight and how air is deflected upward at the base of a hill. In the center are shown the ideal types of hill formations for soaring and gliding. The lower right panel shows how long distance and duration flights are accomplished in a sailplane.

they sound. After you have learned your gliding speed and range from a given altitude it is fairly easy to release the rope at the right point and spiral down in a 360 degree turn, land and roll to a stop at the prescribed spot. Like everything else in flying it is mainly the result of practice and good judgment.

In the first article last month I said a physical examination is required only for applicants for commercial, or glider instructor's licenses. None is required for student permits or for non-commercial licenses. In the better glider schools, however, it is the rule to require an eye examination, particularly to test your depth perception. Good schools don't care to have their equipment broken up by people who can't judge within many feet of where an obstacle or the ground is located, and if you are part owner of a glider club ship you should be equally interested not only in saving members from possible injury, but in saving your ship from damage. One of the tricks the optometrist uses in testing your depth perception is a stereoscopic slide showing a pile of bricks. One brick is superimposed so it apparently floats in air, several feet in front of the others. Quite a few people can't see that brick because their eyes lack depth perception, and fail to record the fact that the pile is farther away than the lone brick.



The Reynolds glider is a typical primary training ship.

The above glider, in which Lieut. Barnaby cut loose from a dirigible, is a typical secondary ship.

SECONDARY GLIDER

SAILPLANE

The Bowlus job shown above is one of the most successful American-made sailplanes.

From primary training gliders to secondary ships and sail planes is just a natural step. A secondary ship is simply one with more wing spread and lighter construction, so that the wing loading is much less, and therefore the gliding angle greater. And a sail plane is one with much more wing area, the lightest construction, and the high aspect ratio which is the chief contributor to its ability to soar upward on rising air currents, instead of just gliding down to a landing. In the early days of flying designers talked a lot about aspect ratio, which is the ratio between the wing length and its depth, or chord. During the war, when weight lifting became an important factor on heavily armed ships, aspect ratio was rather neglected. It remained for the Germans to revive it when they began experimenting with sail planes along about 1920.

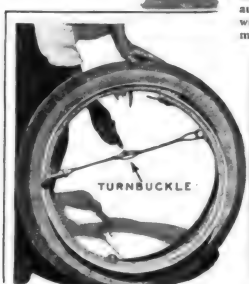
A good secondary ship, such as the Northrop, plans for which are to be found in the MODERN MECHANICS FLYING MANUAL for 1930, is suitable for auto towing if some provision is made for landing gear. Because of its lighter construction and larger wing area it will get off with a much shorter run, and might be launched successfully merely by facing the skid with a strip of steel. Unless it is always flown back to the starting point wheeled landing gear, or a towing dolly should be provided. The wheeled landing gear can be of the double wheel type, as shown for the primary ships in last month's article, or might take the form of a single wheel, mounted in a slot in the bottom of

(Continued on page 194)

Items of Interest to Motorists

This new type of lap robe is held snugly around the waist by means of a band of spring steel, while two additional clamps keep it in place around the ankles.

Thousands of lives can be saved each year by the use of the auto cow-catcher, shown above, which can scoop up a person without injury when the car is going 30 miles per hour. The mechanism is released by a lever underneath steering wheel.



Left—the brace of an old bucksaw can be made to serve as a rim tool as illustrated in this photo. Right—To avoid scraping his car against the side of the building as he drove down his extremely narrow driveway, a motorist built the special concrete steering channel shown here. When once the wheels enter the channels, which are somewhat wider than the tires, the car is naturally self-steering. The ends of the grooves are flared out so that the wheels can enter without scraping or bumping.

Building the M-M

Here's the M-M glider settling down after an easy flight. Note the tow car in background. Pilot Shank, shown at the controls, has the ailerons in position to counteract the glider's drooping wing.

Orville Hickman concludes his story on the building of the "Double-M" glider, so named because it was constructed especially for Modern Mechanics' readers. Wing plans credited to Sam S. Rabl, noted airplane designer. The glider combines best features of the soaring and primary types.

LAST month, in the first installment of this article, I gave a few pointers on the construction of the fuselage, tail units, and fitting details of the M-M Secondary Glider which we built out at Robbinsdale airport for the readers of MODERN MECHANICS AND INVENTIONS. We had ourselves a great time with this glider, which has qualities of durability and graceful flying which explains the enthusiasm of Gene Shank and the other crack pilots who have flown her. She has survived a lot of rough usage and is good for many flying hours yet—all of which proves that she's an ideal ship for the glider enthusiast to build, since she'll not only give beginning pilots the feel of the air, but will do so at a minimum cost.

This month the rest of the plan details are presented, including the wing and further shots of the glider in action. And by the way, you fellows who missed out on the first installment of the article will find it in the January issue of MODERN MECHANICS AND INVENTIONS. If your newsdealer can't supply you with a back number, Andy, the grease-slinging conductor of the Shop Mail Box columns, will send you one on receipt of twenty-five cents in stamps or coin of the realm.

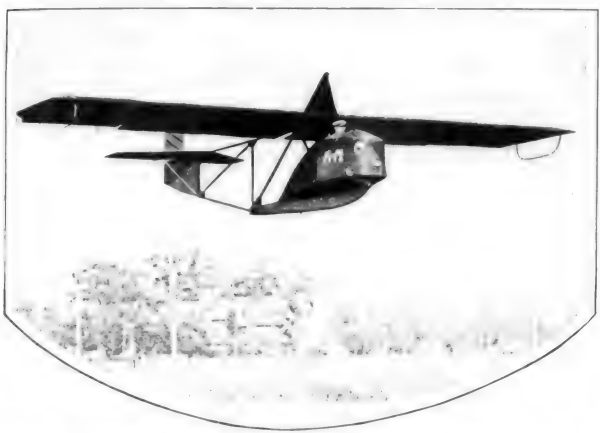
Now to get down to brass tacks. You remember I was talking about tail surface and rudder. Here's where I go on talking:

The drawing showing details of the control stick and torque tube construction presents all necessary information in graphic form. The torque tube is made out of aircraft tubing of 1 3/16" diameter, with 3/64" walls. The control stick yoke is bent around the torque tube as shown and held in place with four rivets. The torque tube is held in place by a bearing strap of 10-gauge cold rolled steel bent around the tube and screwed to the top runner brace. The tube rests in a wooden bearing block.

The control stick itself is made of aircraft tubing of the same dimensions as the torque tube. A detail drawing of the end of the control tube shows how a two-inch pulley is mounted on the end of the tube, through which the cables run to the elevators. The yoke which holds this pulley in position is made of 12-gauge cold rolled steel. This is a little heavier than the grade used for the control stick yoke and the bearing strap, since there is more strain on this part and it is vitally important that it should stand up.

A profile view of the cockpit is shown in one of the drawings. Inasmuch as individual pilots will prefer to exercise their own ingenuity on this item of construction, dimensioned details are not given.

SECONDARY GLIDER



Note how effortlessly the glider seems to float along. This is due to the wing spread, larger than that of primary gliders, which insures a lighter wing loading and makes the craft capable of longer flights.

A small sheet of aluminum for the leading edge of the rudder borrows from the practice of the German aeronautical engineer who designed the Northrop Glider. It is effective, and simple to make.

With the fuselage and the tail surfaces out of the way, the wings are the only remaining problem of any seriousness. These are made like a pair of wings I built a short while ago. The wire bracing is good, and standard Canadian practice, and the tips are the kind I find the simplest to make.

The spars are made of 3/8" plywood web with vertical and horizontal braces of 3/16"x 3/4" spruce.

Do not attempt to use any other kind of wood for these braces, as airplane spruce is the only material having the requisite strength coupled with light weight.

The external depth of the front spar is 7½", while that of the rear spar (or beam) is 4". Other dimensions for the beam sizes and bevels should be taken from the full size airfoil layout.

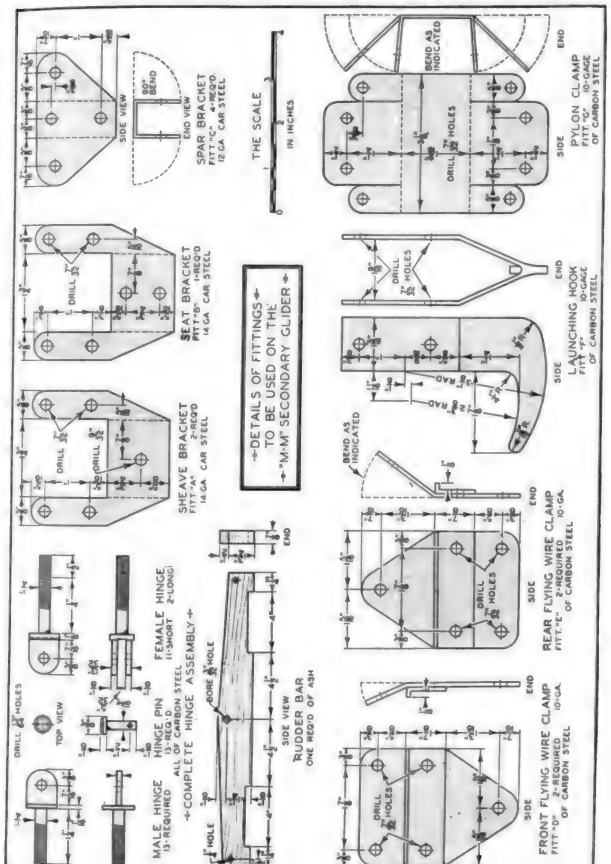
Reinforced beam footings of ¾" ash are used at the roots of the spars to hold the spar brackets. A mortise is cut one foot from the root so that the horizontal braces may be set in flush with the edges of the root piece. A 3/8" slot is cut from the same mark to hold the plywood web.

After the end of the web has been inserted into the slot of the root piece the braces should be applied as shown on the plan, using casein glue and ½" bright wire nails. It is hardly necessary to state that extreme care should be taken with the nailing in order that the wood remain undamaged.

Inside the ninth horizontal brace a six-inch filler of 3/16" plywood is placed on the both sides of the beam, and it is over this that the wing brace clamps are nailed. The construction of both front and rear

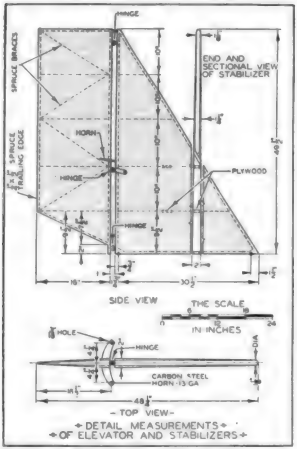
Here's the Wing Plan—Follow It Very Closely For a Successful Glider

Rudder Bar, Hinge Assembly, Brackets, Launching Hook Are Shown



Dimensioned drawings above make construction of minor fittings a simple matter for the builder.

Elevator Details Shown Herewith



Follow this drawing in making the elevators and stabilizers. The scale makes dimensioning easy.

beams are identical except for the vertical dimensions. It is well to use a long table or bench, or spread the beam between saw horses while doing this work.

It will be necessary to construct a jig before tackling the construction of the wing ribs. In making this jig you will save time if you will draw out a full size rib outline on a board or on heavy paper tacked to your workbench. The jig form may then be nailed around your outline and you are ready for work.

Starting with the leading edge, the nose-piece is cut from fibre as shown on the wing rib drawing. A notch is cut in the tip into which the nose stringer will be fitted. One cap strip of 3/16" square spruce is then placed in the jig. The rib webbing of 1/16" plywood is then placed in position with the spruce stiffeners already in place. The other cap strip is then fitted into the jig and nailed in place on three-inch centers. The aileron ribs are constructed in like manner and are cut off back of the rear beam.

You are now ready to assemble your wing section. If the ribs have been accurately built you will find that they will slide snugly into place over the spars, where they are nailed in place through the cap strips. When all are in place the ½" square nose stringer will be inserted into the leading edge of the rib and glued. The .02 aluminum trailing edge will then be bent and placed on the tips of the ribs, where it will be secured with 24-gauge aluminum wrapper clips.

The ½" 20-gauge tubing will then be placed on the tips of the spars and bent to slip over the rounded end of the spruce nose stringer. Next the drag struts are placed on each side of every third rib and the drag wires are strung as shown. The next step will be to place the duralumin leading edge in front of the front beam. Your wing is now ready for covering with fabric and doping.

Now we come to the rudder. You'll find a drawing of the complete assembly which should serve to clear up any doubtful points. The ribs are of spruce, with 3/32" plywood spacers glued and nailed. Flat-head copper nails are used for this operation. A detail of the trailing edge shows how ¼"x½" spruce is used, with 3/32" plywood gusset plates. From beam to leading edge the rudder is covered with 7/32" plywood. The leading edge, which is of spruce, is notched to accommodate the ribs.

The control horn for the rudder is made of ¾" spruce cut to the dimensions given. Two holes of 7/32" are drilled through both tips of the horn ¾" from the outside edge. The overall dimensions of the horn are 10". Note that the detail of the trailing edge construction is typical for the complete tail construction. The beam of the rudder is of ½" spruce. Gusset plates are of 3/32" plywood, and the bottom of the rudder is of the same material.

The metal fittings of the glider are shown in the accompanying drawings. They are made of carbon steel, of the gauges specified. The designs are first laid out on the metal and then cut out with a cold chisel. It is essential here that the dimensions be followed closely.

In making the launching hook, it will be necessary to cut out two pieces of the same dimensions. These two pieces are welded together to form the completed hook.

To perform the bending operations which are required in making the clamps and the spar bracket, place the piece in a vise just below the line of the bend and pound evenly.

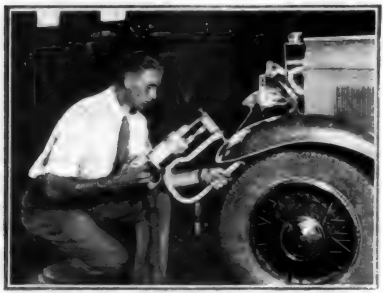
Three Action Photos of the M-M Glider Being Towed Into the Air

Glider and tow car ready for the start. The car was driven in second gear to insure constant acceleration. Man on running board transmitted pilot's signals to driver of car.

The glider in the air after the tow car has stopped. Photo gives a good idea of the height attained by the ship. A 500-foot manila rope was used for towing the glider.

Pilot Gene Shank bringing the glider down for a landing. This photo was snapped a few moments after the one in the center of the page. Skids on the ends of the wings protect them from damage in the event of a rough landing. The glider settles with the grace of a sparrow landing on a wire.

MOTOR MECHANICS



Edited by

RAY F. KUNS

The conductor of this monthly department, who is a recognized expert in the automotive industry and the author of several widely read text-books, keeps you in touch with developments in his field and teaches you the proper care of your car and motorcycle.

New Electric Fender Hammer Removes Dents in a Hurry

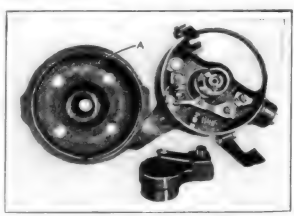
CLYDE C. CRAM, of Colfax, Washington, has recently invented an electric fender hammer which has many points to recommend it to mechanics who are called upon frequently to straighten fenders and remove dents and creases or restore the shape and contour of various sheet metal parts. A patent has been applied for on the device and it is expected that it will shortly be on the market.

The tool employs a crank lift for the hammer and a drop or spring actuation for the working stroke. In connection with the hammer an anvil is used which is adjustable to vary the length and power of the stroke. A half turn of the handle covers the entire stroke range of the hammer and may be made while the tool is in operation. The hammer delivers about 1000 strokes per minute. The inventor and the machine in use are shown in the above photograph.

Faulty Caps Cause Misfiring

NOT infrequently it happens that a short will develop within the distributor cap, which results in the engine misfiring. The cap and distributor head illustrated, gave faulty performance, due to this fault. It will be noted at A, in the illustration, that the inside of the cap is "tracked" and rough, in fact, the roughness is caused by burning. This burning had developed to the point where the engine was misfiring. On a test, with the spark plug wires disconnected, it would shoot a spark to the cylinder block, but would not fire the engine.

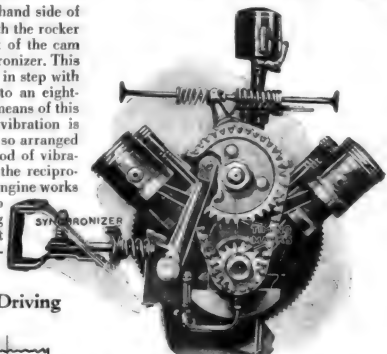
This is accounted for by the fact that the resistance to the passage of the spark is much greater within the cylinder than in non-compressed or normal atmospheric conditions. Under the test, the spark would jump the short air gap from the end of the wire to the cylinder head, but under operating conditions, the spark, owing to the increased resistance, followed a crack in the cap to another wire and thence to a cylinder which was not under compression, thus misfiring of the engine occurred.



A burned distributor cap, such as the one illustrated here, will cause misfiring and faulty performance until corrected. "A" marks the burned track.

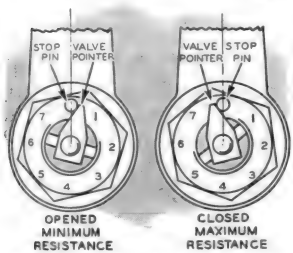
Vibration Synchronizer on New Oakland Vee Type Eight

THE device shown at the left hand side of the engine and in contact with the rocker arm bearing on a cam just back of the cam gear, is what is known as a synchronizer. This synchronizer is designed to work in step with the periodic vibration inherent to an eight-cylinder engine of vee type. By means of this simple device a synchronizing vibration is induced within the engine and is so arranged as to counteract the natural period of vibration, which would be set up by the reciprocating parts of the engine, as the engine works at speed. By taking thought to thus neutralize this disturbing vibration a very smooth and quiet operating engine has been secured.



A phantom view of the Oakland 8 showing pistons, valve assembly and vibration synchronizer.

Set Shocks for Winter Driving



At the left is shown the needle valve of a hydraulic shock absorber set for light action while at the right it is set for heavy action summer driving.

IF YOU are having trouble with your car riding hard during the winter months it may be due to the fact that your hydraulic shock absorbers have been set up for summer driving and are too stiff for this colder weather.

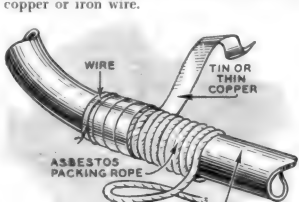
A needle valve adjustment, in the case of the Ford Model A and many other cars, regulates the action. Turning the needle valve in makes the action stiffer and turning the needle valve out makes the action lighter. Experiment will give you just the right adjustment.

If the hydraulic shocks on your car are not controlled by a needle valve, consult your instruction book for means of adjusting to control the ride.

When the Heater Fails to Heat

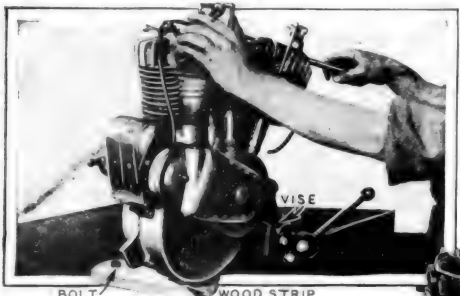
IT SOMETIMES happens that although the car is equipped with a good heater, it does not keep the occupants comfortable because heat is lost before it reaches the compartment.

To remedy this secure some asbestos rope. Starting at one end of the exposed pipe wrap this rope, with the turns lying snugly against each other, until the entire pipe has been covered. In order to protect this covering use some thin copper or tin, cut in strips, which are wrapped over it and bound by means of copper or iron wire.



Here is the way to wrap the exposed portions of the exhaust pipe so that heat will not be lost before it reaches the outlet in the passenger compartment.

The Right Way to Support Motorcycle Engine on Bench



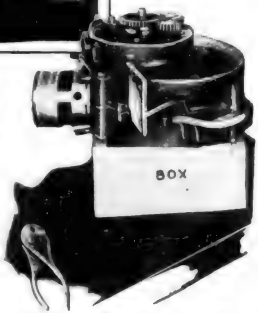
This bolt and wood strip will hold the motor firm

ALWAYS support the motor properly while stripping or assembling it, to avoid breaking cylinder ribs or damaging any nuts or screw threads, as would happen with a loosely held motor.

Fasten a strip of wood (about one inch thick, four inches wide and eight inches long) to the bench, with one bolt close to the vise. This strip is to be used as a rest for the motor when the front crank case lug is clamped in the vise jaws.

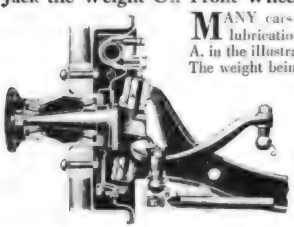
When tightening or loosening nuts, etc., always brace the motor with the other hand. Only one bolt is recommended to hold the strip so that the latter can then readily be swung aside when not in use, allowing other work to be done in the vise without interference.

To hold the crankcase while removing the casing studs, make a box of one inch lumber, about eight inches square and four inches deep. Pad the open end with cloth to prevent scratching the enamel or finish of the crankcase.



This box, padded at the open end, will keep the crank case from being marred

Jack the Weight Off Front Wheels When Lubricating the King Pins



Clean and lubricate the ball and socket joints at B and where the drag link connects to the ball at C. If the weight is removed from the wheels and the grease gun applied, grease will have a chance to find its way to the king pins shown at A.

MANY cars steer hard because the ordinary methods of lubrication do not insure any grease getting to the pins A, in the illustration, and bushing of the steering knuckle body. The weight being on the wheels prevents the grease finding its way past the pin, with the result that hard steering is evident.

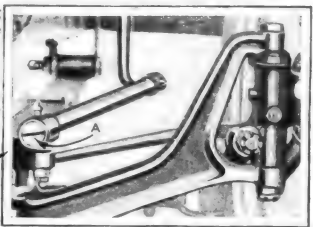
If the weight is removed from the wheels and the grease gun then applied, grease will have a chance to find its way into the bearing.

If both wheels are raised at the same time the steering gear may be worked so as to facilitate the greasing process.

When the wheels are on the jack, check up the entire steering gear system for play, making such adjustments as are needed. Always check the wheel for spindle bearing play, turning the castellated nut under the hub cap to remedy this.

Taking Care of the Steering Gear Drag Link on Your Car

ORDINARILY the ends of the steering gear drag link, as illustrated at A in the accompanying figure, are provided with a ball and socket joint; that is the ball is on either the steering arm or the radius arm of the steering knuckle. The socket consists of two hollow ended washers against which are compressed short springs. A screw, shown as A in the illustration, is screwed up against the spring, the spring in turn forcing the hollow ended washers against the ball.



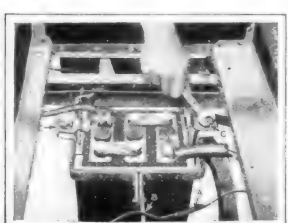
Above, at A, is shown the drag link screw, while B shows the simple home-made drag link tool described here.

When setting about the job of tightening these ball and socket joints, the first thing to do is to remove the cotter key, then use a wide screwdriver or make a special tool, such as is illustrated at B. This tool may be made from a spring leaf. Sometimes it is desirable to have an offset, as shown, or the spring leaf may be ground to fit and then an adjustable wrench used on it.

Ofttimes the screwed plugs of the drag link become so rusted in that it is quite a proposition to move them. The spring tool will do the job. If the spring tool will not break loose the screw, then use a heavy hammer to back up on one side and a lighter hammer to tap it all around, thus breaking loose the rust within. A bit of penetrating oil will help to loosen it, after which it should be screwed all the way out, the joint completely disassembled, the parts cleaned and then reassembled. Tighten the screw quite tight until there is no play between the spring and the screw itself. This assures the proper fit against the ball and eliminates all play in this part of the steering gear.

Keep the Battery Hold-Downs Tight and Wires and Cables Anchored

OWING to the very nature of the battery, it is inclined to shake itself to pieces if not properly fastened within the container. This condition is due to the fact that while lead is rather heavy, it is not particularly strong.



In fastening the hold-down bolts at C, C, make them snug but do not use undue force. Protect cables where they cross the frame.

When fastening the hold-down clips, C, C, as illustrated herewith, do not use too great an amount of pressure. To do so is liable to cause damage to the battery container, pulling the ends of the battery away from the cell jar cover. This will result in a loss of electrolyte and admission of dirt to the end cells of the battery, with the result that battery failure comes much earlier than it should.

The battery cables about the car should be given some attention. The one shown at B has been allowed to lay loose over the cross member of the car frame. While this is not particularly harmful to start with, it may result in the wearing away of the insulation and continual discharge of the battery, owing to shorts developed. When cables are repaired, as shown at the splice at A, solder should be used and after the parts have been spliced by soldering, tape should be applied. The cable should then be fastened to the car frame with tape or with some means which will prevent them being worn unduly and result in failure.

How to Build the

by
MAURICE I. FLAGG

Home building costs frequently run far beyond the original estimate. Herein, Mr. Flagg tells you how, by careful planning and wise choice of designs, you can cut down costs to an irreducible minimum.

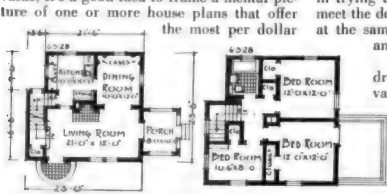
This attractive home, built on plan 6-S-28, is finished in stucco and has a sun porch.

House, plan 6-BV-26, finished in plain brick.

A DOLLAR here, a dollar there, dollars, dollars everywhere. How the dollars do slip away when you build a new house! Changes, extras and more extras often boost the final cost far above the original estimate. And you finish with a yoke of indebtedness that appears everlasting, plus a load on your hands that is heartbreaking.

But this need not be so, not at all, if you watch your step and study your plan with the utmost care in advance of "hopping off" on your journey to happy homeland. First and foremost you should keep an eagle eye on labor. Labor frequently runs as high as 50% of the total cost for even a little house. Anything that saves labor, saves dollars. And inasmuch as everyone wants to make each homebuilding dollar buy the limit in value, it's a good idea to frame a mental picture of one or more house plans that offer the most per dollar expenditure and post yourself on labor saving construction.

The two plans here illustrated have often been referred to as "America's Most Popular Floor Plans." One is for a two-story, six-room dwelling. The other a modern five-room bungalow. Both are within the $5000 price range. They represent the sum total experience of many builders and designers in trying to evolve room arrangements that meet the demands of the average family, and at the same time offer low cost without in any way cheapening construction.



Upstairs and downstairs plans for the houses shown above. For blueprints send $1.00 to the Modern Mechanics Building Editor.

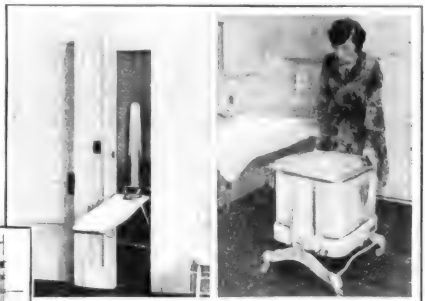
Both houses have been built hundreds of times with almost as many variations in exterior treatment. Like a well known advertisement that says "Most Miles Per Gallon," so, too, these houses might be described as "Most House Per Dollar."

Let's look into the two-story six-room house, Plan 6-S-28, illustrated in stucco

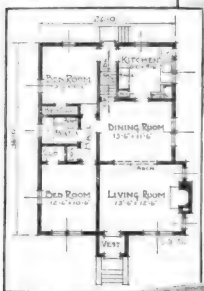
Most House per Dollar

HOW TO GET A BLUEPRINT AND TWO PLAN BOOKS

A one-sheet blueprint of any house appearing in Modern Mechanics magazine may be had for $1.00, postage prepaid. Two new plan books, **HOMES FOR NEWLY WEDS**, containing 32 of the latest ideas for low cost homes in all styles, and 16 **SELECTED HOMES FOR LEAN PURSES** containing time, space, and labor-saving bungalows, may be had for 15 cents each, or both books for 25 cents, postage prepaid. Address Home Building Editor, Modern Mechanics magazine, Minneapolis, Minn., for blueprints and plan books.



Left—Unused space between studs conceal fold-away ironing boards and breakfast nooks. Right—Washing machines that can be pushed under tables out of sight are now popular in kitchens.



Floor plan, shown above, and exterior view of home, plan No. 5-B-32.

said before, labor is the largest single item on every house. That's one of the reasons why square houses are popular. They do cut labor to a minimum.

In addition to being square this house provides an arrangement of rooms that meets the demands of the average family. What are those demands? First, three bedrooms or three bedroom equipment. Also a living room, dining room, kitchen and bath room. Second, low cost. Third, permanency of style. Fourth, good resale value. You have them all in this house, plus a sun porch.

If you wish to place the house on a lot as narrow as 35 feet you can do so by building the sun porch to the rear of the dining room. You can extend the sun porch upwards, and space above may be used as a sleeping porch. Study of the plan shows that there is not an inch of unused space. The fireplace is an inside unit and accommodates the flue for the kitchen range. This is a stroke and brick, and study its economies and values. In the first place it is square. Square houses cost less. Why? Because there are no crooks, turns, offsets, complicated roofs and do-dads to require extra labor by workmen. As I have

(Continued on page 192)

Floridian Makes Durable Crockery From Palmetto Fibre

Moulded from substance made of palmetto fibre and concrete, these products are very durable.

C. P. WILHELM, a grizzled prospector of the old school, has made a strike which bids fair to rival any bonanza of the days of '49. But, strange as it may seem, his claim is located among the warm palmetto groves of Florida instead of in the frozen Alaskan hills. His claim consists of thousands of acres of these hitherto commercially valueless palmetto trees from whose fibre he manufactures a plastic substance that he moulds into pottery, floor and roof tiling, statuary, garden furniture, bric-a-brac of various kinds, and even caskets. The articles are only one-fourth as heavy as similar sized articles made of cement, and every bit as durable.

Mr. Wilhelm's workshop is located on the shores of Charlotte Harbor. Here he worked for seven years to develop the plastic substance, which is composed of ground palmetto fibres mixed with cement of his own formula. To give his products a severe test, he buried several samples in the bed of the harbor, and on taking them up eighteen months later, he discovered they had successfully withstood the onslaughts of wind, salt water and sand. Mr. Wilhelm has repeatedly turned down offers to turn his workshop into a bustling factory. He prefers to live humbly, filling the needs of fellow citizens and tourists.

World's Largest Lorry Has Two Control Columns—Travels at Night

WHAT is claimed to be the world's largest lorry is so huge and takes up so much room on the road that it can travel only at night, when there is no traffic congestion. Two drivers are required to maneuver its enormous bulk along the roads and around curves—one to guide the front wheels and another to control the rear wheels. The lorry is used to transport extremely heavy pieces of machinery and boilers as shown in the photo below.

World's largest lorry is here seen conveying a huge boiler to Dorking, England.

Free Analysis of Your Handwriting

The analysis of hand writing specimens Nos. 1, 2, and 3, shown above, constitute the second of a series of articles by M. N. Bunker, world famous grapho-analyst, who will also read your character free from a sample of your handwriting. What characteristics these specimens reveal is told below.

ACCORDING to the findings of graphology, a man who breaks his o's and a's, or for that matter, his g's in the way shown in specimen No. 1 above, is likely to be unreliable—responsible neither as a friend or as a business associate. Others may make breaks in their circles but the writer who breaks his a, o, or g at the base line is telling a secret that he might otherwise be able to hide completely.

There is another thing that is noticeable in this respect. Such a writer may write with either the left or right hand. He may use a pencil or pen and ink. These points are not important, for no matter how he writes or what he uses for the writing, he will live up to the tale told by his handwriting.

On the other hand your man who writes the complete circle and ties it with a knot, as in specimen No. 2, will not tell a secret even under pressure. He may be questioned for hours, but there is something in his nature that causes him to keep still. It is not stubbornness; he is not refusing to tell what he knows because of a blind refusal to aid, but he just does not talk freely. The writer who "ties" his o's and a's shut with a knot will not even cover details in telling personal matters to friends. His disinclination to tell things is not even overcome by his friendship.

The writer of specimen No. 3 will "talk his head off" on the slightest provocation. He tells things without realizing the importance of what he tells, and when he has a very active imagination is likely to be counted as a liar, when in fact he is just talking without intending to deceive.

Evidence such as is revealed in these specimens makes handwriting valuable to the psychiatrist, the police officer, the social worker, and the employer.

Your latent powers and talents, as revealed by your handwriting, will be analyzed for you free if you will send a stamped, self-addressed envelope, together with a specimen of your handwriting, to M. N. Bunker, care of Modern Mechanics and Inventions, Minneapolis, Minn.

Model Indian Teepee Lamp

Decorated with the Indian designs shown above, this model Indian teepee floor lamp makes an attractive ornament for your room.

by FAY E. WARD

Floor lamps usually follow a conventional design that makes them monotonous in their similarity. Here, however, is a lamp that is not only very practical, but distinctly novel, and in good taste.

AN interesting design for a floor lamp—one which is distinctive in appearance and which will give that vague thing called atmosphere to a room—can be laid out by following the plan of an Indian teepee. To those who have a warm and affectionate interest in America and its early history, and who at the same time go in for the novel and attractive in the way of furniture, a lamp of such a design will make an instant appeal. The teepee also lends itself to a wide variety of decorative schemes which are highly ornamental and unique.

Before constructing the framework of the teepee, it will be necessary to cut out a piece of ⅜-inch veneer board to serve as a mounting. This board is a piece of soft pine, 14 inches square, with a twelve-inch circle inscribed on it as shown in the drawings on the opposite page. In the center of this, a nine-inch circle is inscribed and cut out with a keyhole saw.

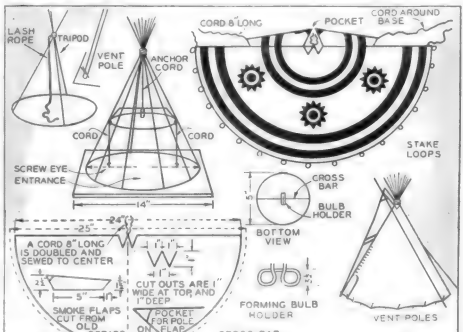
The framework is made of twelve 17″ poles, ½″ at the base and ⅜″ at the top. Two of these are used to support the smoke flaps, while the other ten make up the main framework. First, three of them are fastened together as shown in the drawings and lashed together at the top with a lash cord 26 inches long, one end of which is used as the anchor cord.

The bulb-holder frame consists of a hoop of stiff galvanized wire 5″ in diameter, and looped to grip the light bulb as illustrated

Plans Show This Teepee Lamp Realistic in Every Detail

in the drawings. The two ends of the wire which hold the bulb are soldered to the wire hoop, which is in turn lashed with small thread to the poles of the framework. The anchor cord from above, and the two additional cords from below, are then fastened to the wire hoop to give rigidity to the whole structure.

With this much of the lamp completed, you can next set up the rest of the tent poles. The bases of these poles, as well as the other three, are nailed around the twelve-inch circle at the bottom, and lashed with lash cord at the top, along with the others. The tent cover is made from a piece of unbleached muslin, 26 inches by 14 inches. In laying out the pattern, draw a semi-circle 24 inches in diameter, leaving a ½-inch margin around the edges for the hem. At the top, in the center, cut two V-shaped notches as shown in the drawings. The smoke flaps, which can be cut from any scrap material, are sewed on the edges, next to the notches. In the hems of the smoke flaps and in the hem of the tent cover are sewn lengths of strong cord, with loops in the latter for the tent pegs. Small pockets are sewn in the corner of the flaps to accommodate the vent poles.



Various details of construction are shown above. The framework is made of poles nailed to the baseboard at the bottom and lashed together at the top. The cover is held in place by means of cords and loops in hem.

Before stretching the cover over the framework, you will have to paint on the decorations. First, with the cloth stretched out tight, apply a coat of clear shellac. When it is dry you can then paint on your design, using waterproof ink and a ball bearing pen, or water or oils. Here, let your taste be your guide.

With this task finished, you are ready to put on the cover. Tie the drawstring around the lower circular edge, so that the straight edges overlap about half an inch, and pin the two edges together with stakes made of small match sticks, as shown. Then pin on the door which, incidentally, is made of the same material as the tent, stretched over a U-shaped piece of willow. One-half inch cobbler's shoe nails driven in the base at a 45 degree angle serve as tent pegs.

When the cover has been stretched on neatly, and without wrinkling, the only job left is to prop up the smoke flaps with the two remaining poles. One end of each of these is thrust into the pockets in the corners, while the other ends are nailed to the base with small finishing nails. If the bottoms of these poles are bevelled they will set down on the base much more snugly and hold more securely. Tie the cords attached to the bottom of the smoke flaps to the tent pegs in front as shown. The base board of the model can finally be stained green to represent grass or brown to represent earth.

It is advisable to handle the frame lightly to avoid damaging it. In selecting a stand for the lamp, you can let your taste be your guide. An ideal stand would be a thin totem pole. Any good wood carver should be able to design and carve such a stand for you at a small cost.

German Firemen Protected by Odd Sprinkler System

A modern German fire-fighter arrayed in his new individual sprinkler system which is operated off a connection attached to the hose nozzle.

IT'S a far cry from the old bucket brigade to modern fire-fighting efficiency. Even now the American fireman is known as a "smoke-eater," but that term would hardly fit the present day fire laddie in Germany, for with the new portable sprinkler system adopted by some of the larger cities of that country a fireman may approach quite close to the flames without becoming singed.

The outfit, which looks like a deep sea diver's uniform is equipped with a sprinkler helmet which operates off a connection attached to the nozzle of the hose. The fireman can control the spray by a simple movement of a hand lever.

Ship Swims With Fins Like Fish

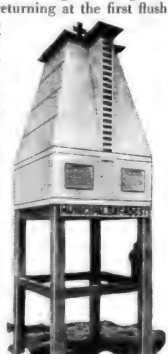
SHIPS built like fish, with fin-like paddles to drive them instead of the usual screw propeller, are proposed by Walter Riemann, a German engineer, who has built and tested two models of his invention.

The hull of the new ship reverses the conventional shape of a sharp bow and blunt stern, the blunter end being forward. The propelling mechanism consists of two long, horizontal ladders, with vanes like small swinging doors. Moving rods wave the hinged vanes back and forth so that pressure is created only on the backward stroke, thus acting like the fin of a fish or the hand of a swimmer.

Texas Bats Come Home to Roost

IN THE vicinity of San Antonio, Texas, is a string of bat roosts, built by the municipal authorities to house the myriads of bats that formerly lived in caves in the vicinity. These bat roosts are peculiarly shaped houses, looking like the cut off steeple of a country church, or like some of the old fashioned square wooden farm silos in the middle west. On one side is a wing-shaped ventilator.

Bats are found all over Texas and the southwest, in huge cave colonies. They come flying out in clouds at twilight to range far over the country, returning at the first flush of dawn to the caves. Instead of being dangerous, as many people believe, bats are not only harmless but benefactors of mankind, for they feed on the vast swarms of mosquitoes that infest not only the swampy places and marshy lakes near San Antonio, but other marshy spots, from the equator to the north of Alaska, and all over the world.



These 40-foot bat roosts are protected by law.

The San Antonio bat roosts are protected by a municipal law.

FREE AS A HAWK ON WING

SOAR away — wherever fancy calls you. Swoop down to that little lake you've glimpsed from the highway. Wing your swift and easy way over roads and trails to new adventures — to new cities worth seeing, and new people worth meeting.

Free as a hawk you are, when you're riding a Harley-Davidson. All roads are yours. You breeze by car parades, and flit through traffic jams. You can ride as much and as far as you like, for Harley-Davidson cost-per-mile is next to nothing!

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Check your age group.

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Address .....

..... *Age* .....

Nothing Is Wrong With Aviation!

(Continued from page 50)

made on schedule were now a reality. The men who had made aviation their life work, knowing the hardships and dangers, were very positive that many developments and changes must be made before the practicability of such flights would be insured. However journalists and feature writers were only too willing to capitalize on thrilling flights already made and predict flights for the coming years.

Lindbergh, on account of the circumstances surrounding his flight, became a popular hero. The public never tired of reading of his exploits and quite naturally, soon were reading all aviation articles. People began to crowd around airports. Air transports filled to capacity and additional planes were required to carry the overflow. The aviation industry boomed and for the first time was given a place in Wall Street. The public was in just the proper frame of mind to attract promoters and investment bankers. New companies were launched and all stocks went sky rocketing upward. Securities with sound values were watered and the public as usual was left holding the sack. Then it was that the aviation industry followed in the footsteps of the automobile industry. Several years ago the automobile industry had gone through the same mushroom growth with the result that many companies went by the boards and the industry in general suffered. Thus the aviation industry was ripe for a bad slump but it did not come quite as soon as most thinking men thought it would.

Now let us take a look and see just what happened during that period from 1927 to date that would indicate 'that little of transcendent importance has been going on.' Let us consider operating air lines and production of aircraft for three representative years 1925, 1927 and 1929.

	1925	1927	1929
Total mileage of airways	2,669	8,068	36,735
Mileage of lighted airways	2,045	2,129	10,358
Total miles scheduled	2,102,848	4,128,029	14,145,079
Total miles flown	1,972,598	3,823,214	13,205,640
Pounds of mail carried	509,300	1,101,414	7,096,940
Passengers carried	200,000	463,397	3,160,793
Planes produced	(Figures not available)	1,565	6,000
Aircraft and parts exported	$797,139.00	$1,903,560.00	$9,480,114.00

(Continued on page 174)

Light As A Feather... Yet.. Holds Rupture!

Now an Ohio Scientist Is Helping Nature Rescue Thousands of Rupture Victims from Needless Rupture Pain and Discomfort. He Has Perfected a Tiny, Feather-Weight Magic Dot System That Frequently Brings About Joyous Relief and New Comfort From the Very First Day. Countless Former Cruel Truss Victims Everlastingly Thank This Interesting Discovery for Their New Happiness and Relief. Just Mail the Coupon for Free Material Sample If You, Too, Are Interested.

Beware the Small Rupture That *"Doesn't Bother Much"*

If you had never seen an electric lamp and someone tried to describe it to you by comparing it with an oil lantern, it would not be understood. It seems about as useless to try to compare New Science System with the old fashioned truss. But now rupture victims can abandon torturous trusses. For science has at last developed a tiny rupture device, weighing less than an ounce, which, together with the other parts of the system, has helped thousands of rupture sufferers and won the admiration of many doctors and scientists.

What Is Magic Dot System?

Its results are often so remarkable—so quick—you may wonder how such a simple invention could accomplish such benefits. It is a remarkable thing. It is a radical departure that makes utterly unnecessary the suffering often caused by knobs that gouge, steel springs that are harsh, leg straps and leather pads that are unsanitary and cumbersome.

It "Breathes" Air

Magic Dot anchors a flesh-soft padlet composed of a newly perfected substance named Airtex. This is honey-combed with microscopic air cells that tend to "breathe" air with each movement of your body. It expands and contracts as easily as your own flesh. When you walk, run, bend or exercise, it tends to squeeze itself—not the part of the body it rests against. Imitation is now more sure—because the padlet can be washed clean and sweet in a jiffy.

New Possibilities

Just imagine a tiny padlet as soft as flesh—as light as desired—yet held securely in place at all times—whether you are standing, sitting, lying, exercising or moving about. No slipping or skidding sideways. No constant readjustment as of old.

Test Sample Free

Send no money. Just mail the coupon for Free Sample of remarkable Airtex. See what it is. See how it "breathes" air and gives promise of amazing new comfort. Wash it and see why it is so sanitary and cool and clean. With it we send, without charge, latest copy of a very new and informative book on Rupture and Hernia that should open your eyes.

NOW . . . 10 Days' Trial by Actual Wear

Here is the inventor's unusual offer. If you will fill out and mail the coupon at the bottom, he will send full details of his "10 Day Trial by Actual Wear" offer on his newest Efficiency Model. This offer is so unusual that ruptured people should lose no time in mailing the coupon at the bottom for full particulars without obligation.

NEW SCIENCE INSTITUTE
2581 Clay St., Steubenville, O.

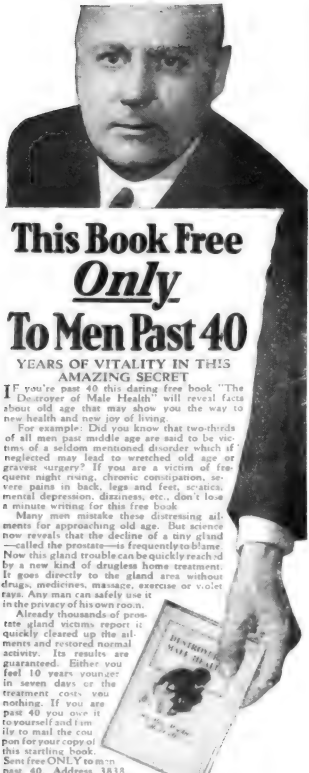
New Science Institute,
2581 Clay Street,
Steubenville, Ohio.

Send me full details of your "10 Day Actual Wear" trial offer on your newest Efficiency Model. Also include free sample of "light as a feather" material. This is not an order and does not obligate me in any way.

Name .....

Address .....

City ..... State .....
(Print address and be sure of reply)



This Book Free
Only
To Men Past 40

YEARS OF VITALITY IN THIS AMAZING SECRET

IF you're past 40 this daring free book "The Destroyer of Male Health" will reveal facts about old age that may show you the way to new health and new joy of living.

For example: Did you know that two-thirds of all men past middle age are said to be victims of a seldom mentioned disorder which if neglected may lead to wretched old age or gravest surgery? If you are a victim of frequent night rising, chronic constipation, severe pains in back, legs and feet, sciatica, mental depression, dizziness, etc., don't lose a minute writing for this free book.

Many men mistake these distressing ailments for approaching old age. But science now reveals that the decline of a tiny gland—called the prostate—is frequently to blame. Now this gland trouble can be quickly reached by a new kind of drugless home treatment. It goes directly to the gland area without drugs, medicines, massage, exercise or violet rays. Any man can safely use it in the privacy of his own room.

Already thousands of prostate gland victims report it quickly cleared up the ailments and restored normal activity. Its results are guaranteed. Either you feel 10 years younger in seven days or the treatment costs you nothing. If you are past 40 you owe it to yourself and family to mail the coupon for your copy of this startling book. Sent free ONLY to men past 40. Address 3838 Morris Ave., W. J. Kirk, President, Steubenville, Ohio.

W. J. Kirk, President,
3838 Morris Ave., Steubenville, Ohio.

Send your Free book "The Destroyer of Male Health" and facts about your trial offer. No obligation to me.

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City ..... State .....

Western address—Dept. 38-R, 303 Van Nuys Bldg., Los Angeles, Calif.

Nothing Is Wrong With Aviation!

(Continued from page 172)

Most certainly the above figures indicate that the air industry has been growing at a rapid rate. There is nothing to indicate that the industry is ailing. 'Tis true that there have been sore spots, growing pains that developed from time to time but the mail went through, passengers arrived at their destinations, new planes and engines were exported and factories enlarged. Airways were extended until today there are very few towns of importance which can not benefit by aerial mail service. On long routes the saving in time is great. On short ones the saving in time is now made by traveling at night. It would be interesting to add the 1930 figures to the above but at this writing they are not available. However, the developments and improvements are of such a character that they appear to be of a permanent nature and that the airways have become an important part of our great transportation network.

So much for that part of the aviation development. The question now arises as to what has been done to improve the reliability of service, to make air travel safer, to cut down the time of travel and to make planes more comfortable for the traveling public.

Reliability of service of air liners is dependent upon the equipment used, training and experience of the operating personnel and the means employed to insure the safe arrival of planes in spite of bad weather and darkness. When air lines were first operated all types of ships were used regardless of age, performance, strength, carrying capacity or comfort of the passengers. A couple of years ago the Aeronautics Branch of the Department of Commerce came into being and things changed. As all planes and pilots working for hire had to secure licenses, the old flying ash cans and the half baked pilots passed from the picture. Modern planes with good performance, high strength factors and with comforts for the traveling public made their appearance. Air lines began competing against one another and thus gave better service.

The Department of Commerce also started an excellent program of lighted airways and intermediate landing fields to make air travel as safe at night as during the day. Weather stations were started at important places and

(Continued on page 176)

"What a surprise I was the crowd the first time I played for them."

Choose Your Course

Piano	Violin
Organ	Clarinet
Ukulele	Flute
Cornet	Saxophone
Trombone	Harp
Piccolo	Mandolin
Guitar	'Cello

Voice and Speech Culture
Piano Accordion
Hawaiian Steel Guitar
Harmony and Composition
Sight Singing
Drums and Traps
Automatic Finger Control
Italian and German Accordion
Banjo (Plectrum, 5-String or Tenor)
Juniors' Piano Course

I haven't known a lonesome evening

. . . . since I discovered this easy way of TEACHING MYSELF *how to play in my spare time!*

IT'S all very well to read or even listen to the radio—*for a while.* But a fellow wants to be doing something—wants to meet people—have a good time. And why not? You're only young once.

Yet somehow I couldn't make friends. I'd be invited out occasionally but these occasions were few and far between. I must have been considerable of a wet blanket at parties. You see, all the other guests were able to do their share toward making things lively by entertaining in one way or another. But I was able to contribute nothing. . . . No wonder they didn't invite me often!

But that was before Bob took me in hand. Bob played the piano marvelously well—and I loved to listen to him.

One evening I commented on his ability to play. He turned to me and said: "Why don't you learn to play? In your spare time, I mean."

Bob's Method

I must have looked my astonishment, for he continued:

"I know lots of fellows who have learned to play the piano, saxophone, even violin, after work. Just a few minutes a day are all that are necessary."

"What!" I exclaimed. "Why, I thought it took *forever* to learn to play. All those scales and exercises . . . Besides, it's too expensive."

"Nonsense!" Bob laughed. "I'll tell you how *I* learned. You think I play pretty well, don't you?" I nodded. "Well, I *taught myself* to play. Right in this room. Without a teacher. And say, it didn't cost a fraction of what those old-fashioned, slow methods do!"

Then he told me all about the U. S. School of Music method. How the lessons come by mail. How there is no expensive private teacher to pay. How easy the lessons are. How you learn to play *by note* right from the start.

"Listen!" he continued. "I'll prove it to you. Send for one of their free demonstration lessons."

Fun—Popularity

I was amazed when the demonstration lesson came. Why, it was as easy as A-B-C! I sent for the piano course. Almost before I knew it, I was able to play real tunes and melodies. And the lessons were such fun!

But the best part came later. I was invited to fill in at a party. This time I didn't sit in a corner all evening. Instead, I took my place with the best of them—actually played two pieces, "Old Black Joe," and the ever popular "Hallelujah!"—that seemed to make an instant hit with the crowd. At any rate, I received an invitation for the very next week. . . .

From then on my playing has steadily improved, until now I can play anything my friends ask me to. Yes—I have plenty of friends now—thanks to my new found ability to entertain at the piano! Every minute of my spare time is now in demand—parties, entertainments, friends and fun. That's living!

This story is typical. The sooner you get started musically, the sooner you'll be popular. Decide now to learn to play your favorite instrument the U. S. School way. Previous musical talent or knowledge is never required. We've proved that to over 600,000 people.

Whether you take up piano, violin, 'cello, or *any other instrument*, you'll find that every single thing you need to know is explained in detail. And the explanation is always *practical*. That's why students of this famous course get ahead *twice as fast* as those who study old-time, plodding methods.

Free Book and Demonstration Lesson

To *prove* how practical our course is we will be glad to send you a typical demonstration lesson and explanatory booklet—*without charge*. The booklet will also tell you all about the amazing new *Automatic Finger Control*. Clip and mail the coupon NOW, before it's too late. No obligation. Instruments supplied when needed, cash or credit. U. S. SCHOOL OF MUSIC, 2622 Brunswick Bldg., New York City.

U. S. School of Music,
2622 Brunswick Bldg., New York City.

Please send me your free book, "Music Lessons in Your Own Home." with introduction by Dr. Frank Crane. Free Demonstration Lesson and particulars of your easy payment plan. I am interested in the following course:

Have you Instr'

Name .....

Address .....

City ..... State .....

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Give You

this STEAM Engine

Husky, powerful "Little Hercules" steam engine, made by Weeden, world's leader in its line. Runs on alcohol or canned heat. Powers mechanical toys. A marvelous engine—and you can have it FREE! Read special offer.

SENSATIONAL STORIES—DASHING ADVENTURE, thrills, interest galore in **Open Road for Boys Magazine**—a real magazine for real, red-blooded boys. Air stories, mystery stories, tales of high adventure. Wonderful departments with prizes for all. Subscribe now. Read special offer.

SPECIAL OFFER: Regular subscription price to Open Road for Boys Magazine is $1 per year. Send us only $1 and we will send you this thrilling magazine for a whole year—12 fat issues—and the Hercules steam engine FREE! (Canadian Postage 25c extra. Foreign 50c extra.) A great offer. HURRY!

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Lowest Prices on Earth!
Thousands of satisfied tire users all over the U.S.A. Our 15 years of business speaks for itself. This big responsible company will supply you with reconstructed standard make tires at lowest prices in history—
Guaranteed to give 12 months' service

Don't Delay—Order Today

CORD Tires Size	Tires	Tubes	BALLOON Tires Size	Tires	Tubes
30x3	$2.20	$1.00	29x4.40	$2.30	$1.10
30x3½	2.25	1.00	29x4.50	2.40	1.15
31x4	2.95	1.15	30x4.50	2.45	1.20
32x4	2.95	1.15	30x4.95	2.90	1.35
33x4	2.95	1.15	28x5.25	2.95	1.35
34x4	3.50	1.15	30x5.25	2.95	1.35
32x4½	3.20	1.45	31x5.25	3.10	1.35
33x4½	3.20	1.45	30x5.77	3.20	1.40
34x4½	3.45	1.45	32x6.00	3.20	1.40
30x5	3.60	1.75	33x6.00	3.20	1.45
33x5	3.60	1.75	32x6.20	3.50	1.65
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DEALERS WANTED

Send only $1.00 deposit with each tire ordered. We ship balance C. O. D. Deduct 5 percent if cash in full accompanies order. Tires failing to give 12 months service will be replaced at half price.

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THE FLAVOR
SPEARMINT
THE PERFECT GUM
LASTS
MINT LEAF FLAVOR

Good and Good for You.

Nothing Is Wrong With Aviation!

(Continued from page 174)

weather conditions radioed or telegraphed at periodic intervals to airmen. Today it is indeed exceptional when an airman must start out on a flight in ignorance of the weather conditions along the route. As a matter of fact the broadcasting of weather reports is now so general that air men can listen in on the radio as they fly along and hear weather reports from several stations one after another. Thus the greatest bugaboo of aviation has been at least partially eliminated. There is no excuse now for a pilot running blindly into bad weather.

Planes have been improved not only as to speed and carrying capacity but also have been given added strength. Furthermore they are now fitted with instruments for flying in fog, rain, snow and at night. Cabin planes have the same comforts as Pullman cars. The public accepted the airplane as one of the several modern means of transportation. Time is annihilated as for instance between Los Angeles and Kansas City where planes leave both ends each morning and reach their destination that same night.

The day has passed when it is necessary for a pay passenger to climb over the side of a fuselage and be blown by a 100-mile-an-hour gale while he looks at the back of the pilot's head. Some planes now carry as many as 30 passengers who ride in comfort in ordinary clothes while stewards serve refreshments or point out scenic landmarks. Special auto transportation is furnished at the terminals to carry the passengers to and from the airports. Thus air travel has become safe, reliable, comfortable and until quite recently, was a money making business.

Now what about these famous flights which have caused so many misstatements as to their practical value but nevertheless have maintained the public interest in aviation. Some of these flights were undoubtedly made for personal gain, others for publicity and notoriety and still others on the spur of the moment as a whim with no real purpose. However, it is indeed a brave man who would say that "none of these flights proved a single thing." If they did nothing else they at least proved that "a courageous, adventurous and methodical young man with careful preparation, good weather and a smile from the gods could fly from New York to Paris;"

(Continued on page 191)

25¢ Buys

GEORGE F. JOWETT

MORE MAN POWER

If you are interested in boxing and want a knockout punch, or if you want to be strong-fisted and strong-armed, this complete course will show you how to get the strength you need in your arms. You can't make a mistake! The guarantee of the strongest-armed man in the world (GEORGE F. JOWETT) is behind this.

A Knockout PUNCH

Quick, alert, enduring men—human dynamos—possess the muscles to come through. You can have the punch of a Dempsey, the agility of a Benny Leonard and the giant strength of a Jowett. I will give you more man power. I will give you a 17-inch bicep—I will give you a 15-inch forearm and an 8-inch wrist. I will mould you from head to foot so that you will possess MORE MAN POWER than you ever dreamed you could have. I will give you endurance, make you able to deliver with the sureness of any strong man who ever lived.

FREE

My new book, "Nerves of Steel and Muscles of Iron," is just what you need. Crowded from cover to cover with facts and stories about the "Thrill of Being Strong." Shows many pictures of strong men I have made, along with winning photos of myself. Free to you with this special offer for a limited time only.

RUSH COUPON TODAY!

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Dear Mr. Jowett:

I am enclosing 25c. Please send me the course, "Moulding a Mighty Arm", which shows how I can quickly get MORE MAN POWER and send too a free copy of the "Thrill of Being Strong."

Name .....

Address .....

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"Cleans Up" for Agents

UP TO $65 WEEKLY IN SPARE TIME!

Men, here is a wonder—the most sensational invention of the age! If you're looking for a rapid fire seller—an item that nets you 100% profit—an item that sells itself to 7 out of 10 men **on demonstration**—I've got it in Ve-Po-Ad, the amazing new vest pocket adding machine.

Sells for $2.50—You Make $1.70

This most remarkable invention does all the work of $200 adding machine, yet fits the vest pocket and sells for only $2.50. It sells on sight to storekeepers, business men and everyone who uses figures—and makes you over 100% profit on every sale. Ve-Po-Ad adds, subtracts, multiplies, divides, takes inventory, tells profits, computes interest, discounts, reckons in all fractions, all weights, lightning fast. Never makes a mistake or gets out of order. Over 100,000 in daily use.

Get This Machine FREE OFFER

Live wire salesmen are dropping everything else and flocking to Ve-Po-Ad. Ve-Po-Ad brings them quick money and lots of it. Singles out in California made $475 in one week! You can "clean up" too! Only 10 sales a day in spare time will bring YOU over $65.00 a week! You need no previous sales experience—Ve-Po-Ad sells itself! If you are really interested in earning a steady, substantial income, write at once for full details of my **MONEY-MAKING PLAN** and **FREE VE-PO-AD** offer to new Agents. Do it **NOW—TODAY!**

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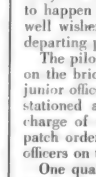

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PROGRESS TAILORING CO.

Dept. S-137 Chicago, Ill.

Harbors Hold Dangers for Liners

(Continued from page 73)

a long line was laid linking this anchor with another at the stern of the vessel. This line ran parallel to the *Fort Victoria*. Hundred-pound sacks of dynamite were beaded onto this line at four-foot intervals. Three other lines, similarly equipped with dynamite, ran parallel to this first line, only they were located at fifteen-foot intervals from the ship itself.

These four lines were bisected by another line, also strung with sticks of dynamite, which ran to the surface where the fuse was to be attached. Johnson also thought of rigging up another line on the other side of the boat to give her a little boost as she eased into her grave. When the charges were set off with a terrific detonation, the *Fort Victoria* slipped gracefully into her grave, where she will lie forever.

Taking a 40,000-ton liner out of her slip or guiding her up the Hudson river into her pier is a ticklish job. In this work, the captains of the sea-going titans have to turn over their ships to the highly specialized group of harbor navigators who are the tugboat skippers.

The reason for having these harbor pilots take over the ships for their cruises up the bay or out of their slips for their ocean journeys is that these highly skilled men possess a thorough knowledge of the waters of New York harbor—they are the only men capable of guiding the mammoth liner through the treacherous currents of the Narrows or the Hudson River.

All that has to happen to cause a disastrous accident is to have a strong tide of the river strike the stern of a 40,000-ton ship, causing her to shift a few feet as she emerges from her slip. If this occurs, she might tear away most of the pier. This has been known to happen when the pier was crowded with well wishers shouting "Bon Voyage" to the departing passengers on deck.

The pilot stands with the captain, usually, on the bridge. Around them is a cluster of junior officers and quartermasters. Some are stationed at telephones and others are in charge of telegraph instruments which dispatch orders to the engine room and to the officers on the poop and fo'c'sle head.

One quartermaster is posted at the wheel which steers the liner. Another quartermas-

(Continued on page 180)

Make America's Airways Your Playground with the New Heath Parasol!

This champion little plane is easier to build—safer to fly—and more economical than any other plane. Start building your Parasol now for only $12.

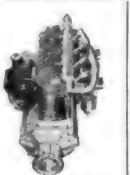
Now you too can enjoy endless thrilling hours flying your own plane. For the Heath Parasol has ushered in a new era in aviation—opening the airways of America for the first time to thousands who never before could fly.

If you have been waiting for a dependable light plane—a plane so easy to fly that experienced pilots land it even with their hands off the controls — the Heath Parasol has been designed JUST for you. For it is the easiest plane to fly ever built. It is off the ground in 4 seconds and at the end of the field it is higher than any other plane. And it lands at a lower speed and stops shorter than any other ship.

The Champion Heath Parasol

COSTS LESS THAN 1c A MILE TO FLY

Consider the unparalleled low flying cost of the Heath Parasol—ACTUALLY, LESS THAN 1 CENT A MILE including gas, oil, storage, etc. Observe that it flies 40 miles on a gallon of gas—note its 85 mile per hour top speed, its 300 pound carrying load—and its 400 mile cruising radius. Then you'll understand why the Heath Parasol is truly America's most popular sport plane.



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The new world's champion light plane motor—winner at the 1930 National Air Races. The result of 7 years of constant refinement. Free from all vibration and bearing difficulties. Delivers 30 H. P. at 3000 R. P. M. Actually opens a new era of safety in the light plane field. Price, fully equipped, including propeller hubs, only $300!

Don't be misled by the extravagant claims of Heath imitators. Their planes merely represent minor adaptations of the original Heath model.

Remember — only the original Heath Parasol gives Heath performance—as evidenced by the results of the 1930 National Air Races where the Heath Parasol won FIRST PLACE in the light plane event for the 5th consecutive year.

START BUILDING NOW

Take advantage of the long winter evenings—and start building your Heath Parasol now. Thousands have completed their Parasol in a remarkably short time and declare it a complete aviation course in itself, transforming dull winter evenings into hours of genuine pleasure. No technical training is necessary as Heath plans are clear and easy to follow. Parts are shipped in 11 convenient progressive groups. $12.00 brings the first shipment! Parts complete only $199—and if you want the Parasol ready to fly away—the price is only $975.

Don't delay another day. Countless hours of flying await you. 10 cents in stamps or coin brings large illustrated booklet. Mail the coupon below today.

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Harbors Hold Dangers for Liners

(Continued from page 178)

ter stands close by with a book, jotting down every command at the precise second at which it is spoken. One hears the expert pilot mumble, "Hard starboard, full ahead, starboard, slow astern port."

One project which has been proposed to overcome the hazards endangering traffic in New York harbor suggests the construction of a breakwater outside the Narrows. This would provide an area in which the liners might anchor while they are in quarantine, when the immigration inspectors and doctors come aboard.

In order to do away with the dangers from sludge, New Jersey and New York pilots associations have recommended widening and deepening of the present channel. It was revealed that commerce in the port of New York increased 113 per cent from 1918 to 1928, while anchorage grounds have been lessened. It is pointed out that this congestion forms a grave danger to shipping.

One of the most picturesque phases of this maritime life which does not extend beyond the three-mile limit is the existence of the *Ambrose Lightship* off Sandy Hook, a vessel with a captain and crew of twenty men. None of these men have traveled a mile in twenty years. A 7,500-pound anchor keeps the lightship in position. She stands guard close by a shoal, warning passing liners of the dangers which lurk close by.

The *Ambrose's* captain, not lacking in a saline pinch of humor, can stand on the deck of stationary steamer—hardy old mariner that he is—glance up the harbor which grimly conceals a thousand menaces to navigation, and murmur, "I'd rather be right here in this one spot, where I've been for over two decades, than go scampering up the tricky wilds of that port which is full of perils." That's the way jolly old Captain Gustave Lange feels about it.

At Sandy Hook, near *Ambrose Lightship*, where the liner is fairly well out at sea, the pilot is transferred from the big giant to the tugboat which takes him back.

ELECTRIC LIGHTS ANYWHERE

Complete 110-volt Electric Light Plant. Ideal for Farms, Camps and Summer Homes.

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Runs household appliances. Install it yourself. Wiring, Fixtures and Lamps for 7 rooms, $17.50. Also larger models D. C. or A. C. Write for circular.

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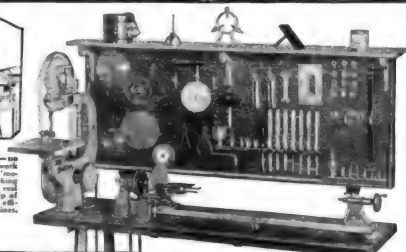
New Units, *New* Features, *New* Improvements in Complete 1931 "*Delta*" Woodworking Line

No more drudgery — no more tedious hand work when you use "Delta"-motor-driven tools. Working will sound becomes a real pleasure with the help of these time-saving, efficient, practical machines.



"DELTA" DE LUXE WORKSHOP — the last word in motor-driven workshops. Includes a 4-speed Lathe, Band Saw, Circular Saw, and Jointer.

"DELTA" BAND SAW has many exclusive features. Provided with special extra-safe guard. Furnished with or without stand.

"DELTA" BORING AND ROUTING ATTACHMENT — makes child's play out of difficult boring, routing, and mortising. Convenient, easy to operate. Furnished separately if desired.

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"DELTA" LINE-SHAFT SHOP

Includes 4-speed Lathe, Band Saw, Jointer and Circular Saw. Operates with either gasoline or electric motor. Very efficient.

Practical Motor-Driven Woodworking Equipment Now Within Reach of All

Again "Delta" blazes the trail toward woodworking efficiency with the announcement of its new 1931 line! Now are available at astonishingly low price levels a complete series of compact, rugged woodworking machines incorporating numerous exclusive constructional features. Each unit embodies the practical, efficient design, the careful workmanship, the dependable quality of materials—for which the "Delta" trademark stands. The new "Delta" Boring and Routing Machine, the "De Luxe" Workshop, the new "Delta" Band Saw, as well as the improved "Handi-Shop" are but a few of the Delta Units that will be of intense interest to all those who work with wood. All units now operate with either electric or gasoline motor power.

Make Things Quickly and Easily With These Modern Motor-Driven Tools

They save time and labor, and produce better work for artisans, farmers and mechanics. Up-to-date craftsmen everywhere are flocking to motor-driven woodworking equipment to eliminate tedious hand labor. And for full or spare-time work, "Delta" Units quickly pay for themselves.

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Send coupon today for free illustrated literature describing the new 1931 "Delta" line. Also details of 10-Day Trial Offer and Easy Payment Plan.

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The biggest value you ever saw advertised anywhere

Haven't you often wished that you could draw cartoons, illustrate some idea, sketch some pretty face, etc.? You can do all of these things. One of America's most famous Cartoonists and Illustrators has developed a great, simple system for success in all branches of Commercial Art. This system has revolutionized the entire theory of drawing. It means that drawing can be as easy for you as writing—much simpler than learning shorthand, bookkeeping or typewriting. We are now placing this original system for learning Drawing, Art and Cartooning, consisting of 24 lessons with over 500 illustrations, within reach of every one. If you will devote a few hours each week to the Course WE ABSOLUTELY GUARANTEE that you will learn to draw and draw well before you have half finished the Course. If we fail to make this claim good, we will refund every cent paid us. By eliminating a large office force for answering correspondence, expensive catalogs, etc., we are enabled to make a price of $2.98, the cheapest price ever known for a high-grade, home study course. Learn to draw. It is a big asset, no matter what field you are in.

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CHAS. HOODWIN CO.
4240 Lincoln Ave., Dept. 9-7 CHICAGO

Testing the Truth of Weather Signs

(Continued from page 87)

The various traditions and proverbs to the effect that the severity of the winter may be inferred from such autumnal manifestations as the thickness of corn husks and animals' furs, the quantity of nuts stored up by squirrels, or the heights at which hornets build their nests, really belong to the same order of ideas, though at first sight they seem more plausible. No clues to the weather weeks or months in advance can be obtained from biological phenomena of any sort, but on the other hand it is true that many animals and plants do react perceptibly to certain weather changes, such as an increase in atmospheric moisture, the darkening of the sky and the like, that point to a coming storm or to some other weather condition of the immediate future, so that some of the proverbs on this subject are fairly well-founded; for example,

"When the peacock loudly bawls,
Soon we'll have both rain and squalls."

Others, however, such as the saying that "a bee is never caught in a shower" and the assertion that various plants always close their flowers before rain, are rules to which there are many exceptions.

Although the moon exercises no control over the weather, the appearance of this luminary is affected in certain ways by the state of the air and by the presence or absence of clouds, and these things, in turn, bear certain relations to approaching weather changes. Hence some of the old rules and proverbs connecting the moon with the weather contain an element of truth. There is a physical explanation for the assertion that "Sharp horns do threaten windy weather," and the rule about lunar halos, "The bigger the ring, the nearer the wet," though it refers to an optical illusion, has a rational basis. On the other hand, there is no truth in the proverbs relating to the attitude of the lunar crescent in the evening sky or in those concerning the time when the moon "changes."

For the scientific weather prophet, there is just one infallible sign, and that is the barometer, or, in the language of the sea, the "glass." Barometric readings all over the country, all over the continent and from the high seas, placed on a map of the United States, graphically pictured and timed, enable the forecaster, with his knowledge and experience in air currents, winds, tides, topog-

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Testing the Truth of Weather Signs

raphy and pressure, to tell you what may happen tomorrow. These data are placed on a weather map to determine the location and movement of "highs" and "lows," that is, areas of high and low barometric pressure. These movements bring certain typical sequences of weather events—shifts of the wind, sky colors, cloud conditions, rain or snow, and so on.

Experience gained in the field of weather forecasting has led Dr. Humphreys to concoct a number of weather proverbs of his own, all of which contain sound wisdom:

"A summer fog for fair,
A winter fog for rain;
A fact most everywhere
In valley and on plain."

"When the morn is dry,
The rain is nigh;
When the morn is wet,
No rain you get."

"Whene'er the clouds do weave,
Twill storm before they leave."

"When the stars begin to hide,
Soon the rain will betide."

"When the forest murmurs and the mountain roars,
Then close your windows and shut your doors."

"Curls that kink and cords that bind,
Signs of rain and heavy wind."

DEAFNESS IS MISERY

Many people with defective hearing and Head Noises enjoy conversation, go to Theatre and Church because they use Leonard Invisible Ear Drums which resemble Tiny Megaphones fitting in the Ear entirely out of sight. No wires, batteries or head piece. They are inexpensive. Write for booklet and sworn statement of the inventor who was himself deaf.

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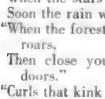

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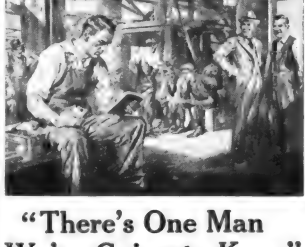

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Explorers Brave Unknown Perils

(Continued from page 95)

The construction plan for the elevator system calls for the sinking of a shaft from the surface of the earth directly above a portion of the Big Room in the cavern. It will go down 750 feet perpendicularly, entering the Big Room in the portion which now houses the tourist restaurant. Two spacious and fast passenger elevators of the latest office building type, and equipped with every modern safety device, will ply up and down this shaft.

The elevators, which will be in operation for 1931, will NOT be used for taking visitors into the cavern, but for bringing them out after the tour is completed. Visitors will go into the cavern as at present, through the natural opening, and along the present trails. Then, after having seen the best portions of the cavern, they will be guided back to the restaurant quarter in the Big Room, and lifted to the surface with the elevators. Visitors will be spared the physical effort of climbing back out of the cave after the natural fatigue incidental to the journey.

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known chambers that cannot now be visited within the time limits and physical consideration of the average visitor. By saving for the visitor the energy that he would otherwise consume climbing out of the cave, it will be possible to extend the underground trip to something like 9 miles.

Even with all his work as chief guide and trail builder, Jim White has always found time for exploration. The devices used in this work were improved from time to time: The double rope, with a parallel rope weighted by a heavy rock as a stabilizer, gave way to the rope ladder—an improvement, but not a satisfactory one, owing to the tendency of the ladder to twist about in mid-air. The wire ladder, constructed by hand of four strands of heavy wire to each side and each rung, was a later invention that met the requirements as nearly as could be expected. By fastening this ladder to a formation and then unrolling it over a precipice, the explorer could descend to any depth with comparative safety.

In going up a precipitous wall, a single rope was used. White would lasso a stalagmite some thirty feet above him and pull himself up by it; reaching this formation, he would rope another still higher up, and so on. There was no wall, if it had formations, that he could not climb in this way. These methods are still in use in the cavern.

Besides bluffs and walls, there is other dangerous ground in the cavern—"bottomless" crevasses, for instance, and pits of decomposed guano, deceptive stuff that looks like dust and seems to be a part of the floor. White's closest calls came from these two sources.

In trekking to a very beautiful and little known room, seven miles from the entrance, a room to which only a few people have accompanied him, White had one of these crevasses to cross. It was 150 feet long, two feet wide, depth unknown. He made the grade by placing his feet on a ledge that ran the length of one of the walls and his back against the other wall and edging himself over the impenetrable blackness beneath. It takes but slight imagination to picture the result of a misstep along here. Once, when mid-way of this crevass, the mantle in the gas lantern he was carrying fell almost in two and was hanging together by a thread. White reached into his pocket for the extra mantle he always carried, only to find that he had

(Continued on page 187)

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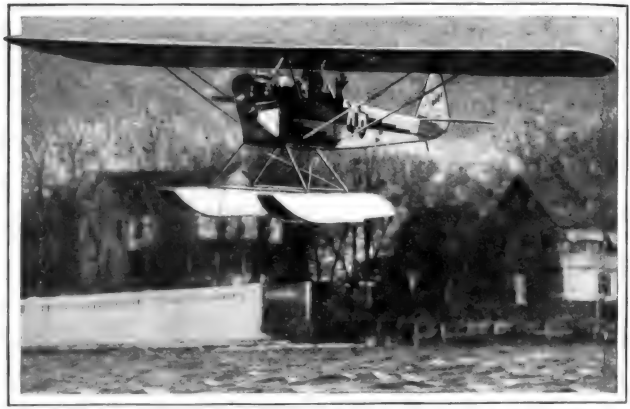

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Look for This Cover:

Explorers Brave Unknown Perils

(Continued from page 185)

lost it. To be left in darkness in this part of the cavern was fatal; for no one would know how to reach him. The least jar would finish the mantle, but he had to go on. Well, Mr. White covered two miles of the roughest and most perilous going with this damaged light still burning!

When exploring a room that opens into the Lower Chamber, White stepped into one of the decomposed guano pits I have mentioned. Instantly, he sank almost to his shoulders in a stifling substance that offered no more resistance than soft snow. No use to call for help; he was alone in the cavern. He fought and choked in the dust that threatened to bury him. Then his feet struck a rock and this saved him.

In 1929, Mr. White resigned as chief guide in the cavern; but he is still the official explorer. His latest discovery is on the east side of the Lunch Room. Following an air current, he took a hammer and broke a passage through a wall of this room. On the other side he found a long tunnel, low and narrow and filled with three feet of water. It led to a series of five very beautiful rooms that cover an area of some four miles. The last of these rooms ended in another narrow tunnel of great depth.

Some ten persons have accompanied Mr. White into this end of the cavern. He had excellent reason to remember that last trip he made with a party, which included a government landscape gardener. On a comparatively smooth surface, the landscape gardener who, by the way, weighed 180 pounds, fell and broke his leg. Of course, he had to be carried out of the cavern. 'Nough said.

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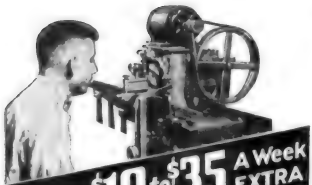

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Navy Flyers Are Shot Into the Air

(Continued from page 81)

and may be rotated so that the launching end may point into the wind. The launching car slides along the track while the plane is automatically released from the car at the end of the runway. Mechanically the catapults are very interesting. A brake automatically stops the launching car as the airplane is released. The car slows down from 60 miles an hour to a stop in its own length. A scientist would explain that the car withstands a force of 100 times its own weight in stopping so suddenly. Were the pilot and plane not released prior to this sudden deceleration, disaster would result.

In the early days launching cars and brakes gave considerable trouble although no pilots were hurt in the frequent accidents to planes. Some of the early catapult cars were made of wood, braced with steel cables, in an effort to keep the weight down. Only failure resulted from the use of these, however, and many of them were smashed.

On the U. S. S. *California* during the first launching of an airplane from that battleship the wooden car spread while in motion down the track. It came loose from the catapult and the plane took off with the launching car and catapult cable still attached. The end was inevitable. When the plane reached the end of the cable it stopped even more suddenly than it started and literally fell apart in the air as it was thrown into the water. Fortunately the pilot's safety belt broke and he was catapulted a second time and fell uninjured into the water.

Although some of the early experiences of pilots may seem to indicate preparation they were in fact necessary steps in the development of our aviation and dependable apparatus. In preparing to catapult a plane today, not only are the plane and catapult serviced and checked carefully, and the plane tied to the launching car so securely that it cannot move in any direction until the automatic release permits the plane to fly away, but also on deck those of the catapult crew watch each other carefully to avoid sending the plane off prematurely.

One of the most inspiring sights with the fleet occurs when planes are launched simultaneously from many ships in formation. At such a time all planes will be ready on their ships from which the launchings are started,

(Continued on page 190)

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Navy Flyers Are Shot Into the Air

(Continued from page 188)

engines warmed up at full power and all hands will be prepared to send the planes away on signal. Finally from the flagship comes a signal to launch—then suddenly the air is filled with planes. When the signal from the flagship reaches a ship further down the line, the pilot waves his arm in a circular motion. This tells the deck crew to prepare the powder charge or adjust the air pressure.

When things on deck are ready the launching officer waves his arm to the pilot. Then, as in all other launchings, the pilot extends his arm, "revs up" the motor, then withdraws it, settles back against the head rest and awaits the deafening report which throws him into the air.

Sometimes we undertake catapulting at night. It is accomplished as easily under the glare of ships' searchlights as during the day. The motor roars, the plane slips down the runway and disappears into the darkness and only the whirr of the propeller remains to remind anyone that another flight is taking place.

That is only part of the story. Everything that goes up must come down—but where? Seaplanes cannot land on battleship decks. They can land only on the water. Rarely can small planes land easily on the open sea. Usually some wind is blowing and occasionally heavy seas are running. Thus the ships manufacture landing fields in mid-ocean.

This is accomplished by swinging the ship around while steaming at from 12 to 18 miles an hour, then stopping it by reversing the engines. This maneuver leaves an area of smooth water which we call the landing slick on the sheltered side of the ship. The plane lands easily, taxies to the ship and is lifted aboard.

Winches hum as the plane is lifted bodily from the sea. "Easy there," calls a sailor on deck. "Lower away. S-t-e-a-d-y. That's well." And the plane settles in its cradle again.

The thrill of catapulting never ceases. Each time I take my place in either cockpit, as pilot or passenger, I look forward to the time when, with a roar and mighty surge, my back moves forward to meet my chest. We rush down the runway, dip slightly toward the water, and gathering speed, pull up into the sky for another "exploded flight" over the ocean.

Nothing Is Wrong With Aviation!

(Continued from page 176)

that "they were trick flights" and that "regular trans-Atlantic air lines were not feasible."

However, some of these flights were of inestimable value, not only in the development of aviation but also to the world at large. Take Lindbergh's flights. His was not the first across the Atlantic but it was the first with modern equipment and was the forerunner of many others. That in itself was quite different from the Alcock and Brown flight eight years before. In 1919 Hawker and Alcock and Brown were the only airmen daring enough to risk such a flight. Furthermore to show the tremendous improvement in airplanes and engines it should be noted that while Alcock and Brown were about out of gasoline when they landed at the end of a 1,800 mile flight, Lindbergh had gas left after a 3,600 mile flight, about twice as far.

Lindbergh's flights turned out to be more than just stunts. His flight to Paris did much to bring about a closer relationship between

(Continued on page 196)

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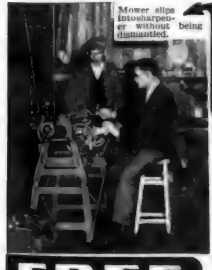

THIS MAN IS MAKING $4.00 to $6.00 an hour!

SHARPENING LAWNMOWERS in Spare Time With the "IDEAL" LAWNMOWER SHARPENER

Man, Why Don't You Do That? You've got the chance—the same chance as W. T. Moore, Twin Falls, Idaho, who made $1200 net profits in 90 days—the same chance as Walter Wever, Middletown, N. Y., who made $1000 in 4 months—the same chance as hundreds of others who have reaped rich rewards with this amazingly efficient lawnmower sharpener.

Use Your Spare Time. If you work at a trade, put an Ideal in your basement and earn $4 to $6 an hour evenings and Saturday afternoons. E. W. McCormick, Saginaw, Mich., writes: "Five years ago I bought an Ideal Sharpener on which I have ground over 5,000 lawnmowers. In the last few weeks I worked at my trade, machinist, full time 9 hours a day. I also ground 97 mowers which netted me $114.10 clear gain.

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Our Free Book Tells You How—these men and many others have made themselves independent—built substantial, permanent, BIG PAYING businesses with this Ideal Sharpener. Send for this book today—It's Free.

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FREE BOOK TELLS HOW OTHERS DO IT!

THE "IDEAL" LAWNMOWER SHARPENER is a wonderfully simple machine that sharpens all makes of mowers perfectly, scientifically, without taking the mowers apart. Just pick up the mower, set it in the "Ideal," make a few simple adjustments and proceed to sharpen. In 15 minutes the mower is ready for the lawn, and you have made $1.50 to $2.00—depending upon the charge you fix. No training required, and machine set up in a few minutes. Plug into light socket and start to sharpen. Hundreds of dull mowers in your locality are waiting to be sharpened. Owners are looking for a place to get them sharpened. Sharpens skates—all kinds—perfectly.

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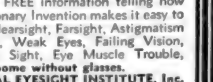
Boys Fly the IDEAL EAGLET



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Why worry about strikes, layoffs, hard times? Get a Government job! Increased salaries, steady work, travel, good pay. I'll help you become a Custom House Clerk, Railway Postal Clerk, Post Office Clerk, City Mail Carrier, Rural Carrier—or get into any other Government job you want. I was a Secretary Examiner of Civil Service Commission for 8 years. Have helped thousands.

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Now FREE My 32-page book tells about the jobs, open — and how I can help you get one. Send the coupon for your copy TODAY.

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Please send me without obligation, your free book "How to Secure a Government Position."

Name .....

Address .....

How to Build Your New House

(Continued from page 165)

of economy. The sun porch adds extra length to a living room of pleasing proportions. A partially open staircase leading to the second floor forms a decorative feature for the down stairs living area. The kitchen is small but planned to "route steps" and cut down both time and labor in kitchen duties. Three bedrooms on the second floor have cross ventilation and light from two sides. All are outside rooms.

Still another flexible feature of this house is the style. It looks well finished in any of several materials. Stucco, solid brick, brick veneer, skintled brick—all lend themselves to the design. Each treatment will produce a house of distinction. If you prefer shingles or siding they will give excellent appearance. The style therefore is permanent. It will outlast passing fads. Which means the resale value should be good for many years.

The house built of frame and finished in stucco has been erected for as low as $4500.

What about the bungalow No. 5-B-32? It is a straightaway plan that offers five rooms on the first floor and space above for storage and extra sleeping quarters. As narrow a lot as 36 feet will accommodate the house, but a wider lot will be better. If you are intent on saving every last penny possible you can omit the fireplace. This may make a saving of $250 or $300. It will lessen the resale value. The house looks well in brick or stucco. It can be finished in siding or shingles.

Creating Illusions for the Talkies

(Continued from page 117)

upper portion and the ceiling. It is tedious but economical.

In theatre sets, since the faces of the audience farther back than the fifth row are always blurred, the studio does not fill its theatres with extras. Instead, the heads of people are painted in from the fifth row back. This is very simple. The artist knows where the seats in the theatre are supposed to be and puts the heads above them, row on row, and the blurred effect hides the fact that they are merely daubs of paint. In "Her Private Affair," the immense theatre set was constructed at a nominal figure. Matting was resorted to in the matter of the boxes at the opera. The curtain was a real one, but the boxes were painted in and filled with people and the film was double and triple exposed.

Sensational Discovery Resoles Shoes for 5¢

RESULTS ARE AMAZING

An amazing, new, greatly improved product—SAVASOLE—that completely resoles shoes for only 5c a pair! Fills in all the cracks and breaks, and makes old shoes look brand new. A putty-like substance that spreads on the soles like butter on bread. No tools necessary—just an old knife. Dries hard and smooth over night, and saves many dollars in shoe repair bills! Absolutely no competition with this amazing new product. Cheap imitations have recently been put on the market, but none can pay you and delight your customers like Savasole. The results are amazing! New, trim, pliable, waterproof soles that look like leather, and wear like iron—for only 5c. Also builds up old run-down heels and makes them look and wear like new. Every member of the family needs it. A blessing for children's shoes.

Agents Making Up to $200 Every Week!

The amazing results obtained with the new improved Savasole have boosted agents' earnings sky-high. Bell of Ohio writes, "I used to sell a cheap imitation product and never got a repeat order, but since selling the genuine Savasole, repeat orders pour in, and I'm making more money than ever before."

Rousen sold his first dozen cans in four hours. Beakley pockets $129 every week.

A sensational trial offer is awaiting every agent who acts quick and mails the coupon below.

Actual Sample on Leather Sent Free!

Be convinced of the startling qualities of the new genuine Savasole, and see how much money it will make for you. Mail the coupon for an actual sample of Savasole on leather. See how tough it is, how it sticks to the leather—how pliable it is—how genuine and leather-like it looks. Don't wait—reserve your territory and get a free sample of Savasole by mailing coupon **today**.

PERFECT MFG. CO.
Dept. K-571 220 E. 3rd St. Cincinnati, O.

Perfect Manufacturing Co.,
Dept. K571, 220 E. 3rd St.,
Cincinnati, Ohio.

Gentlemen: Please send me details of trial offer and free sample of the new improved Savasole.
Please reserve territory below for me.

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Rush only $1.00 now. Pay balance ($2.95 plus postage) when postman delivers. Keep 5 days. If not delighted, return telescope and money will be refunded.

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Charge 25c to look at the moon

ROLL-O SPECIALTY CO.
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$350 per Week in OWN Business!

F. W. Tesnow, Berwyn, Ill., earned $350 his best week. Many others make $125 to $200 per week with the H-B Rug-Washer. E. Anderson, Cedar Grove, N. J., made $87.50 in 10 hours. C. J. White, Louisville, says: "$100 business in 6 days—never a complaint," C. H. Williams, Joliet, writes: "Gave up a railroad job to buy H-B cleaner, $390 work last month and business is increasing." Frank Diedrich writes: "I started business with one H-B Rug-Washer. Today I own large Milwaukee store with 4 machines." Thousands earning quick, easy profits. Electricity does the work. Finishes rugs like new, on customer's floor. Write today for booklet.

EASY TERMS Inexpensive equipment. No shop necessary. Hundreds of customers in your vicinity and in nearby towns — residences, hotels, offices, schools, clubs, theaters. Backed by $58,000,000 Company. Used by the United States Government.

FREE Book Send today (no obligation) for booklet illustrating Rug-Washer and telling how you can earn large profits at prices below other methods; how you can build a permanent year around business; and how you can pay on easy terms. Enjoy a larger income. Mail a postcard or letter today—NOW.

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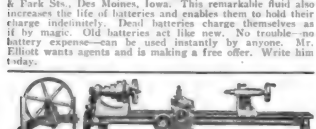

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Write for Catalogue and Prices on these and other machines.

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"Shame on you!" Are you nervous, embarrassed in company of the other sex? Stop being shy of strangers. Conquer the terrible fear of your superiors. Be respected and confident of your future! Your faults easily overcome so you can enjoy life to the fullest. Send 25c for this amazing book.

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No medicine or drugs. Just a light, small, comfortable inexpensive Radio-Active Pad, worn on the back by day and over the stomach at night. Sold on trial. You can be sure it is helping you before you buy it. Over 150,000 sold on this plan. Thousands have written us that it healed them of Neuritis, Rheumatism, High Blood Pressure, Constipation, Nervous Prostration, Asthma and other respiratory disorders. Heart, Liver, Kidney and Bladder trouble, etc. No matter what you have tried, or what your trouble may be, try Degnen's Radio-Active Solar Pad at our risk. Write today for Trial offer and descriptive literature. Radium Appliance Co., 2246 Bradbury Bldg., Los Angeles, Cal.

It's Easy to Become a Glider Pilot

(Continued from page 152)

the fuselage. Captain Frank Hawks used a single wheel, mounted this way, and equipped with a 3"x10" rubber tire on his "Eaglet" in which he was towed across the continent by an airplane. Steel tube wing tip skids, as described last month, also should be added. With the single wheel it is possible to keep the ship level virtually to the end of its run, and with a wing tip skid to protect the wing and aileron no damage will be done.

Sail planes, too, can be launched into the air by auto towing, but, of course, if you operate from flat country, they can only glide back to earth, in the absence of rising air currents. The only difference between a sail plane launching with auto towing and a primary glider launching is that you can use a longer rope, get more altitude, because of their faster climb, and stretch your glide much farther, because of their relatively high gliding angle. A well designed primary glider, with a pilot of average weight, has a gliding angle of about 6 or 8 to 1—in other words it will glide 6 to 8 feet for each foot of altitude it loses. A secondary ship has a gliding angle of about 12 to 1 and a good sail plane glides at around 20 to 1.

If you want to soar with a sail plane you will have to find a hill, or other terrain where rising currents are available. Soaring, which is the last word in glider flying, is the acme of all flying thrills. You take off from your hill top, drop into the valley as you pick up speed, and then find the rising current sweeping up the opposite hill, and begin to gain altitude. Soaring planes have stayed up more than 14 hours and covered more than 90 miles in a straight line. A good soaring pilot must be not only a perfect flyer, but an expert meteorologist, with a full understanding of the invisible currents of the air. The German soaring pilots discovered there were rising currents just under clouds of certain types, and they have practiced cloud flying for hours, hovering just under the condensed vapor.

If you live in flat country, though, you can get all the thrills of gliding that are possible to you with a primary plane, without the expense of building a fragile soaring ship, or paying for the damage which it is bound to sustain in auto launching. In fact you will learn more about the art of flying than most

(Continued on page 196)

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Someone Who Answers My Announcement and Acts Promptly Will Get $3000.00

In the square are 3 letters—H—C—E. When these letters are changed into numbers, the answer is the number of pounds the lion weighs. For instance, A is 1, B is 2, C is 3, etc. CHANGE THE LETTERS INTO NUMBERS—this will tell you the weight of the lion. Rush your answer to qualify for the opportunity to

Win Chrysler Sedan and $1000.00 Cash

You may be the one who will get the Chrysler 8 Sedan and $1000.00 cash extra if you are prompt.

Find The Answer—Send It By First Mail

Others have won up to $4500.00 by first answering my advertisement. We recently paid Mrs. Pat Green, Texas, $3750.00; Howard Zilter, Kentucky $2625.00; Kate Needham, Oregon, $1000.00, and many others—over $100,000.00 paid to winners of automobiles, cash prizes and awards. Now you can win $3000.00.

I'll Give $8000.00 Cash

Yes, I'll pay $8000.00 in prizes,—six fine automobiles and many big cash prizes. You may win a new $2000.00 Chrysler 8 Sedan and $1000.00 cash, or $1000.00 all cash, if you are prompt.

$1000.00 Cash Extra For Promptness

I want quick results and will give $1000.00 cash extra just for quick action, and duplicate prizes in case of ties. Someone who answers my ad will receive a $2000.00 Chrysler Sedan, plus $1000.00 if prompt, or $3000.00 all cash. EVERYONE WHO TAKES ACTIVE PART WILL GET CASH MONEY. No matter where you live, IF YOU WANT TO WIN $3000.00 RUSH YOUR ANSWER TO ME for full information. Send no money. Rush your answer by first mail.

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Attach letter stating age, occupation, employer's and references' names and addresses.

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Have you a home workshop in your basement? If you have, you need a copy of How-to-Build-It. See page 209 for details.

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Need firm but comfortable support

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Send 10c coin for circular about "Wall Castings."

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5900 N. Fairfield Ave., Chicago, Ill.

It's Easy to Become a Glider Pilot

(Continued from page 194)

power plane students ever acquire, for it will give you the "feel" of a ship and the air to an extent impossible to attain with a faster power craft.

That's why gliding is being seriously considered by several aviation schools, and why next summer may see it required as a preliminary course before taking dual instruction in an airplane. If that happens the cost of aviation instruction may be sharply reduced, and the time required greatly shortened. Instead of a 20 to 30 minutes' lesson a day on a power ship, you can do an hour or an hour and a half at a time on a glider without fatigue, or two lessons a day of an hour each.

Nothing Is Wrong With Aviation!

(Continued from page 191)

the United States and European countries. His flight through Central America was a diplomatic triumph which assisted in the elimination of misunderstandings and troubles.

Byrd, Wilkins and Lindbergh all made exploration flights. Lindbergh relocated Mayan settlements which had been lost to the world for centuries. Byrd and Wilkins in their Arctic and Antarctic flights demonstrated the possibility of radio communication between these inacessible places and the rest of the world and the use of the camera in bringing back records of prominent points in the thousands of square miles of heretofore unexplored territory over which they flew. Furthermore, they brought back data and information, admittedly of little monetary value but most assuredly of great value to the scientific world.

If the dozen or more successful transoceanic flights have been of no other value they have shown the improvements in the reliability of engine and airplane, in the load carrying capacity, in the navigation instruments and in the ability of the airmen to fly their craft through the most adverse weather conditions. These flights have also been responsible for bringing out the radio beacon, an aid to navigation of great value in long flights and in thick weather. They have also brought out greatly improved and new types of compasses such as the Sun Compass with-

(Continued on page 201)

Step INTO A BIG-PAY HOTEL JOB

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IN America's 3rd Largest Industry comprised of Hotels, Apartment Hotels, Clubs, Restaurants, Institutions, Camps, Schools, Colleges, Hospitals, etc. Daily calls for Lewis Trained Men. Over 70,000 high class positions as Manager, Assistant Manager, Steward, Engineer, Room Clerk, Publicity Director, Sports Director, Purchasing Agent, Bookkeeper, and scores of other executive positions paying $2,500 to $10,000 a year open annually in hotels alone. Salaries up to $2,500 to start.

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Send me the Free Book, "Your Big Opportunity," without obligation, and details of your Personal Coaching Plan.

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Send for full size illustration of machine

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After: Slavin at 65

SLAVIN INSTITUTE, Dept. 64, 500 S. Dearborn St., CHICAGO

Motorcycle Engine Powers Ice Sled

(Continued from page 134)

on cross steel straps as illustrated. The rear of the seats can be hinged to one strap, and the front supported at an angle by a small spring placed between the seat bottom and a second cross strap. Springs taken from a baby carriage give ideal resiliency for this purpose. The front seat should be placed just back of the tank timbers and the rear seat about the position shown in the drawings. The foot rest for the rear passenger can be the spring strap of the driver's seat.

The runners can be made from any hard wood of 1-inch thickness. They are 2 ft. 4 in. long; the two front runners being 6 inches wide and the rudder five inches wide. Shoe them with half round steel and file to a sharp V edge, countersinking all screw heads. Pivot the two forward runners just back of the centers and 1½ inches below the top edge. Bolt two runner blocks as shown under the ends of the 6-ft. cross timber, separated just enough so that the runner will oscillate between them. Use a heavy bolt for a pivot and grease it well before assembling. The runner is pivoted between the halves of the split end of a length of 1-inch pipe. It should work free but not loose enough to wobble. Run the pipe up through a hole in the center of the rear wood cross timber and assemble with washers above and below to bear against the wood and take up all undue play. This rudder post should work fairly stiff but free enough to turn without binding. The tiller is shown in detail, and consists of two arms of flat steel cut and bent at the same angle and bolted by the vertical legs to each side of the rudder, about three inches back from the rudder post.

The steering control is shown in Figs. 1 and 2. It consists of an automobile steering wheel and shaft run down through the Tee in the rear engine frame, where its lower end rests in a socket on the front top cross timber. Any marine hardware company can furnish a suitable fitting to answer to such a socket. Bolt a motorcycle sprocket to the front of the steering wheel spider. Then run a chain over the sprocket and down through two rollers fastened to the rear ends of the tank timbers. Allowing enough chain for operation, fasten a wire cable to each end of the chain and run these lengths through pulleys attached to the under part of chassis side frame and to each end of the tiller. Adjust chain and cable

(Continued on page 200)

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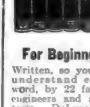

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Motorcycle Engine Powers Ice Sled

(Continued from page 198)

until all possible slack is taken up. Also adjust rollers and pulleys until undue friction is eliminated.

Much of the speed and the ice-worthiness of the craft will depend upon the type of propeller used with your particular engine. For a two-cylinder engine of usual motorcycle horsepower and developing about 1000 R.P.M., an air propeller from four and one-half to five feet long with a four-foot pitch will be found about right. You can make your own or buy one as desired, although the manufactured kind will probably be found to be the most practical. If home-made, glue and screw 6-inch pipe or spruce boards together until a 4-inch section is procured and then carve carefully to shape. For this home-made type, the mounting is shown in detail. It consists of a sprocket mounted direct to the crankshaft of the engine with a pipe flange on the opposite side of the prop, the two being bolted together through the propeller hub. Center it carefully after mounting and obtain a balance by carving away the extra weight on either blade.

Spark and throttle controls will be up to the builder. Probably the best means will be to keep them on the engine as originally planned and then run steel control wires to the steering wheel. No brake is used on the Zipper as sufficient braking can be produced by cutting the engine and drifting in against the lazily rotating propeller.

When your craft is fully completed and tuned up, a propeller guard had better be fashioned from heavy meshed chicken wire and supported in front of the prop by a suitable iron rod frame fastened to the cross timbers and the pipe frame.

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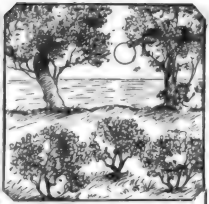

FIND 7 FACES

In this picture the silvery moon is shining through the trees and bushes and it makes some funny shadows. Some look like faces of people. Can you find at least 7? Some straight at you, some are upside down, etc. Look sharp, and *mark each one* you find. If you find at least seven, clip the picture and send to me with your name and address.

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Nothing Is Wrong With Aviation!

(Continued from page 196)

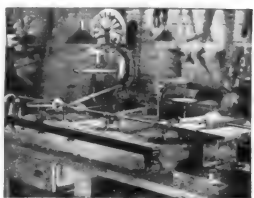
out which Polar flights could scarcely have been made.

Then, too, as the old pathfinders and pioneers of the early 1800's made the trails and laid out the roads for the western migration in the United States, so the long distance flights have located the air routes which now connect North and South America. They have advanced the operation of the aerial mail routes by causing the establishment of airports and airdromes.

Refueling flights have demonstrated the reliability of modern engines, engines that can remain in the air from 150 to 600 hours without missing a stroke. There is no comparison between such engines and those of 1926 which struggled to keep going for a short 36 or 37 hours. These record breaking flights each taken by itself may mean nothing but considered collectively, are invaluable to aviation development. They have caused a demand for better equipment which the airplane and engine factories could not ignore and had to meet.

'Tis true that "only part of the present air routes offer real utility to the average traveler except in case of emergency" but the balance is in favor of the many that save considerable time such as those connecting New York and Chicago, Chicago and San Francisco, Kansas City and Los Angeles, Seattle and San Francisco and several others.

(Continued on page 203)



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Nothing Is Wrong With Aviation!

(Continued from page 201)

The aviation industry has been criticised for establishing two or more airdromes in one town when one would do, building large airplanes when fast small ones are the proper kind; for not having greater speed of mail planes than 100 miles an hour; for building tandem two seaters; for not eliminating the fire hazard; for failing to construct retractable landing gear; for not developing planes with high flying and low landing speeds; for government aid to the industry.

Let's see what these criticisms are all about. Most pilots will tell you that they have landed on one of 12 or more airdromes surrounding a town and flown through such a congestion in the air that they have wished that there were double the number of airports. As much air as there is overhead it will only accommodate a given number of airplanes in a certain locality at any one time. Increase the number and there is grave danger of collisions.

Who knows what the future plane will be —a large one with detachable parachute supported cabins, many small ones, a mother plane with several gliders in tow or something else too unorthodox for my imagination? The fellow who can see far enough into the future to answer that question could make his fortune. One should remember, however, that although the steam engine was invented over a hundred years ago there are constant changes being made in its construction, size and shape.

A short time ago while on a flight, I cut into an air mail route. I thought that I was doing fairly well cruising along at a speed of about 115 miles an hour but when a mail plane passed me as if I were tied to a stake, my plane seemed like a Jenny. A fellow would certainly be a sucker to bet on a 100-mile-an-hour cruising plane in a race against one of the present air mail planes.

Why not build tandem two seaters? Perhaps some people may prefer that type. Automobiles are still building and selling cabriolets.

It is unfortunate that gasoline is highly inflammable as it constitutes a great fire hazard. That is true whether the gasoline is in an airplane, automobile or used to light a fire in a kitchen stove. However, it looks as if the Diesel engine is coming right along

(Continued on page 204)

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FIND THE TWINS

Below are 12 pictures of Clara Bow, the great Paramount Movie Star. Look at these pictures carefully. At first they all look alike—but that's the "catch"—so study them closely—do not make a mistake. Follow the clues.

Clues: Somewhere among these pictures are two, and only two, exactly alike—identical in hairdress, collars, and cuffs. They are the twin pictures of Clara Bow. If you are lucky enough to find them, by all means rush the numbers of the twins to me for submission to puzzle Judges.

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If your answer is correct you will be eligible to win a brand new 90 h. p. Waco airplane (and complete flying instruction) or $2850.00 cash—with $850.00 extra for promptness, making the total $3,700.00 all cash. Many other prizes paid at same time. Duplicate prizes awarded in case of ties. Cash reward for all taking active part. No prize less than $10.00. No more puzzles for cost to solve. No obligation. Perhaps YOU may be the winner of the highest prize! Send no money, but hurry!

M. J. MATHER, Advertising Manager, Room 28, 54 W. Illinois St., Chicago, Ill.

Nothing Is Wrong With Aviation!

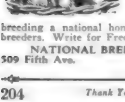
(Continued from page 203)

and perhaps that's the answer to the fire hazard of gasoline powered aircraft.

Designers, users and constructors of airplanes are trying to determine whether retractable landing gear is at this time a luxury or a necessity. There is no doubt but that it increases the speed of the plane but it also adds considerable weight which cuts down performance. Most certainly any landing gear of the retractable type which is as sturdy as the ordinary type will be much heavier and further complicate an already complicated piece of machinery.

Just what constitutes high flying and low landing speeds is a matter of opinion. There is now in commercial use a type of plane that has a total passenger carrying capacity of 5 and has a high speed of 175 miles an hour, cruising speed of about 140 miles an hour and a landing speed of 70 miles an hour. Some people think that plane meets the requirements.

Taking everything into consideration, the aviation industry has made great strides during the past few years. There are more air lines operating with far greater normal loads of passengers and mail. Our aeronautical exports are jumping by leaps and bounds. We have air routes connecting our network with Canada and Central and South America. In spite of everything our air liners are still carrying mail and passengers. Our planes, airdromes and airways are as good if not better than any abroad. In view of this, one may well believe that there is nothing the matter with aviation when we, to use an old saying, look at the doughnut instead of the hole.



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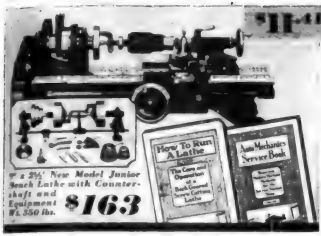

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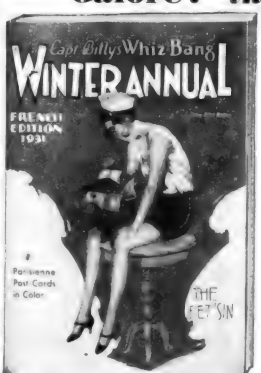

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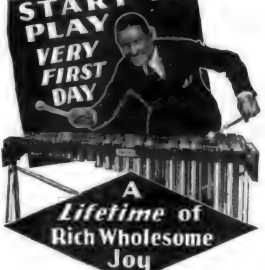

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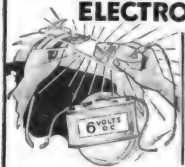

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What Will New Cars Look Like?

(Continued from page 46)

road resistance is a fixed factor, but if the wind resistance can be reduced the car either will go faster with the same power, or attain its previous top speed with less power.

The special racing cars built for the Daytona Beach record tests were marvels of streamlining. In the late Sir Henry O. D. Segrave's car streamlining was carried to such perfection that the car threatened to leave the ground and fly through the air at high speeds, and the same trouble has been experienced with other racers at Daytona.

While the effect of the wind on a moving body is spoken of as resistance, the trouble is chiefly due to a partial vacuum in the rear of the body, and not to the air pressure in front of it. With a streamline form the air diverted in front is brought around to the rear and joined again without setting up swirls, and hence there is no thin air pocket following along behind the body to hold it back.

In the Burney car the currents are carried smoothly back until, at the rear, the only obstruction is a small projection of the motor hood. Cooling air for the engine is brought in from the bottom and exhausted through the louvres in the tail of the body and the motor hood. The only objection to this practice is that the air from beneath the car is filled with road dust, but with modern air cleaning methods that probably will not be a drawback. The air drawn through the engine compartment is exhausted at the tail in such a way as to fill in any partial vacuum spot which might be created by the projecting motor hood.

Another car recently introduced in England is a little eight horse power roadster which is claimed to have a top speed of seventy-five miles an hour. At the Olympia motor show another of the baby cars, described as a miniature Rolls Royce because of the perfection of its appointments, featured a sliding roof panel for sunlight and ventilation.

Frameless, multiple shift cars, such as the European-built Tatra, are also attracting attention in the design departments at Detroit. One manufacturer imported a Tatra and is putting it though exhaustive tests. The Tatra has twelve speeds and individual wheel mounting which eliminates a frame, in the usual sense of the word.

(Continued on page 207)

Looking Over the NEW BOOKS

AVIATION ENGINE EXAMINER
By Victor W. Pagé. The Norman W. Henley Pub. Co.,
$3 6 x 9; 440 pp. New York

This is the book which Andy, that popular conductor of the Shop Mail Box, swears he is going to use when the questions in his fan mail become a little too technical for him to handle unaided.

But don't get the idea that this book is written in a dry and over-technical vein. Quite the contrary. It is written in such a lucid and entertaining style that the veriest tyro, not knowing the difference between a carburetor and a spark plug, might read this volume and emerge at the last chapter with a most comprehensive knowledge of the construction and maintenance of nearly every type of aero engine in popular use today.

The book is written in the popular question and answer form, and Major Pagé must have been an instructor at a school which boasted of an unusual number of extraordinarily curious pupils, for the author lists questions that it is hard to believe could have been obtained from other sources. After asking the questions Major Pagé proceeds to answer these queries in a most thorough manner, using photographs, drawings and charts wherever these will help with the explanation. Any person having anything whatever to do with aviation motors will find this up-to-date volume invaluable.

What Will New Cars Look Like?

It is the nearest approach on the market today to the dream of a gear-shiftless car with an infinite range of speeds, virtually a speed for every added revolution of the engine. Several years ago a Greek engineer in London named Constantinesco developed a torque converter which eliminated gear shifting, and it was tried with some success, but

(Continued on page 208)

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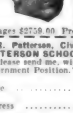

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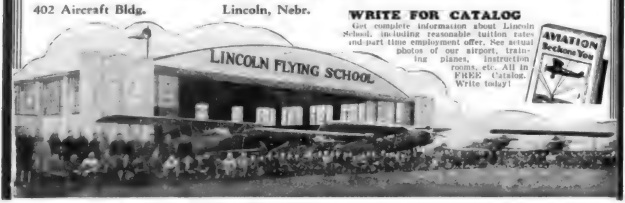

What Will New Cars Look Like?

(Continued from page 207)

has not as yet proven practical in volume production.

The theory of the Constantinesco device requires higher mathematics and considerable knowledge of physics to explain or understand, but in operation it allows the engine to idle without transmitting motion to the wheels. When the accelerator is depressed and the engine speeds up the torque converter changes its motion and begins to impart rotary motion to the shaft, the speed of the motion depending on the engine speed and the resistance of the car. In other words, starting from a dead stop, the device imparts the engine revolutions to the transmission in the form of few revolutions at high power, and as the car gets under way and resistance decreases the converter changes its movement and transmits more revolutions at less power. It automatically adjusts its speed to the power required to overcome resistance.

Other developments which have at present not gone beyond the laboratory stage include the use of compressed air engines and the use of dual motors in gear. It would be possible to install a compressed air engine powerful enough to drive a car, using a fuel tank to hold a small supply of the compressed air, but obviously this would be unsatisfactory on a long trip. To get around this objection, the gasoline motor under the hood would be used to build up air pressure, which in turn would be transmitted to the rear axle. This system of propulsion would give more flexibility than is possible with present gas engines.

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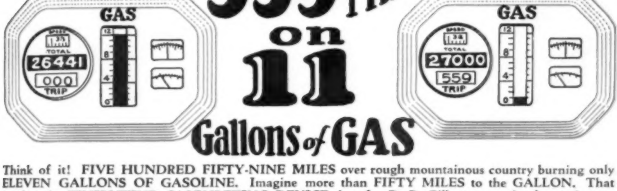

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Arthur Grant: "I have an Oakland touring car that has been giving me 15 miles to the gallon average, but I can see a great difference with the Whirlwind, as it climbs the big hills on high and gives me better than 23 miles to the gallon of gas, which is better than 50% saving in gas."

W. A. Scott: "I had my Whirlwind for three years. Winter and summer it gives the same perfect service, instant starting, smoother running, and what I have saved in gasoline these last few years has bought other luxuries which I could not have afforded previously."

Car owners all over the world are saving money every day with the Whirlwind, besides having better operating motors. Think what this means on your own car. Figure up your savings—enough for a radio—a bank account—added pleasures. Why let the Oil Companies profit by your waste? Find out about this amazing little device that will pay for itself every few weeks in gas saving alone.

FITS ALL CARS

In just a few minutes the Whirlwind can be installed on any make of car, truck or tractor. It's actually less work than changing your oil or putting water in the battery. No drilling, tapping or changes of any kind necessary. It is guaranteed to work perfectly on any make of car, truck or tractor, large or small, new model or old model. The more you drive the more you will save.

SALESMEN AND DISTRIBUTORS WANTED

To Make up to $100.00 a Week and More

Whirlwind men are making big profits supplying this fast-selling device that car owners cannot afford to be without. Good territory is still open. Free sample offer to workers. Full particulars sent on request. Just check the coupon.

WHIRLWIND MANUFACTURING CO.
999—427-A, Third Street Milwaukee, Wis.

GUARANTEE

No matter what kind of a car you have—no matter how big a gas eater it is—the Whirlwind will save you money. We absolutely guarantee that the Whirlwind will more than save its cost in gasoline saved within thirty days, or the trial will cost you nothing. We invite you to test it at our risk and expense. You are to be the sole judge.

FREE OFFER COUPON

WHIRLWIND MANUFACTURING CO.
999—427-A, Third Street, Milwaukee, Wis.

Gentlemen: You may send me full particulars of your Whirlwind Carburetting device and tell me how I can get one Free. This does not obligate me in any way whatever.

Name .....

Address .....

City .....

County ..... State .....

☐ Check here if you are interested in full or part time salesmen position.

This Queer Little Automatic Device Protects My Car From Thieves ELECTRICALLY!

I have hit on something truly amazing. Since the first discoveries of radio, I know there has been nothing so startling and uncanny. My little secret device guards every part of your automobile from spare tire to headlights and steering wheel. In your garage or on the street it is on the job 24 hours a day. Never sleeps, rests or gets tired. Already approved by insurance companies and motor associations. Now offered on 5-day test.

Puzzles Everyone

THIS little, automatic "electric-watchman" invention is called "Devil-Dog." It is not only a new kind of device, it is an *entirely new idea!* Absolutely unique and utterly different than anything anyone ever saw before. So startling that it grips the imagination of everyone from the millionaire Rolls-Royce owner to the fellow who drives a second-hand Ford. Until he knows the secret every motorist will swear that you have some one hiding in your car. He just simply can't *believe* there can be such a device as this queer "electrical-watchman."

INSTALLED IN 10 MINUTES—COSTS NOTHING TO OPERATE

Every man who owns a car can afford Devil-Dog. Actually, no man who owns a car can afford to be *without* this inexpensive protection. Last year over 116,000 automobiles were stolen in this country. Millions of dollars worth of spare parts were pilfered by sneak thieves. Now Devil-Dog can be installed by anyone in ten minutes or less. There is absolutely no cost for operation. No extra batteries to buy. It will last as long as the car. And you hide the secret switch button anywhere you want to around your car. It's nothing but common sense for a man to grab Devil-Dog the very first time he sees it demonstrated. No wonder distributors already are cleaning up young fortunes!

5-DAY FREE TEST

I invite readers of this magazine to send for the special 5-day test offer now being made on Devil-Dog. Test it. Show your friends. If your present income is less than about $50 a week, profit opportunities as my spare-time or full-time representative may surprise you. My one condition is, I want men to help me *quick!* Write me today!

AUTOMATIC
DEVIL DOG

NORTHWEST ELECTRIC CORP.
Dept. B-550, Pukwana, South Dakota

RECORD EARNINGS—$138 IN A DAY

Every Devil-Dog sale brings you a nice profit. No penny-ante little business! That's another reason Devil-Dog is a *real* big money maker! G. Oliver, Illinois representative, reports, "Made $138 in a day. That is the easiest way to make money quick I ever heard of. My next order will be for 1,000. That's the top record so far. Who will be it first?

POLICE BUY FOR ARMORED CAR

Richard Jacques, Canada, just started, writes, "Here's our order for 24 Devil-Dogs. I have sold one to the police for their armored car. Am also getting letters from the Chief of Police and the Detective Department. Tomorrow we demonstrate to the motor league."

Northwest Electric Corp., Dept. B-550,
Pukwana, S. Dak.

Rush territory details and your 5-day test offer without obligation.

Name .....

Address .....

Town ..... State.....